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CIVIL ENGINEERING

SEPTEMBER

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1947

DEEP CYLINDER PIERS support heavy superstructure of deck-type, double-track bridge on line of Santa Fe Railway over Colorado River near Topock, Ariz. See article in this issue.

Economic Problems Confront Arizona Highway Planners

Safety Measures Can Avoid Costly Construction Fires

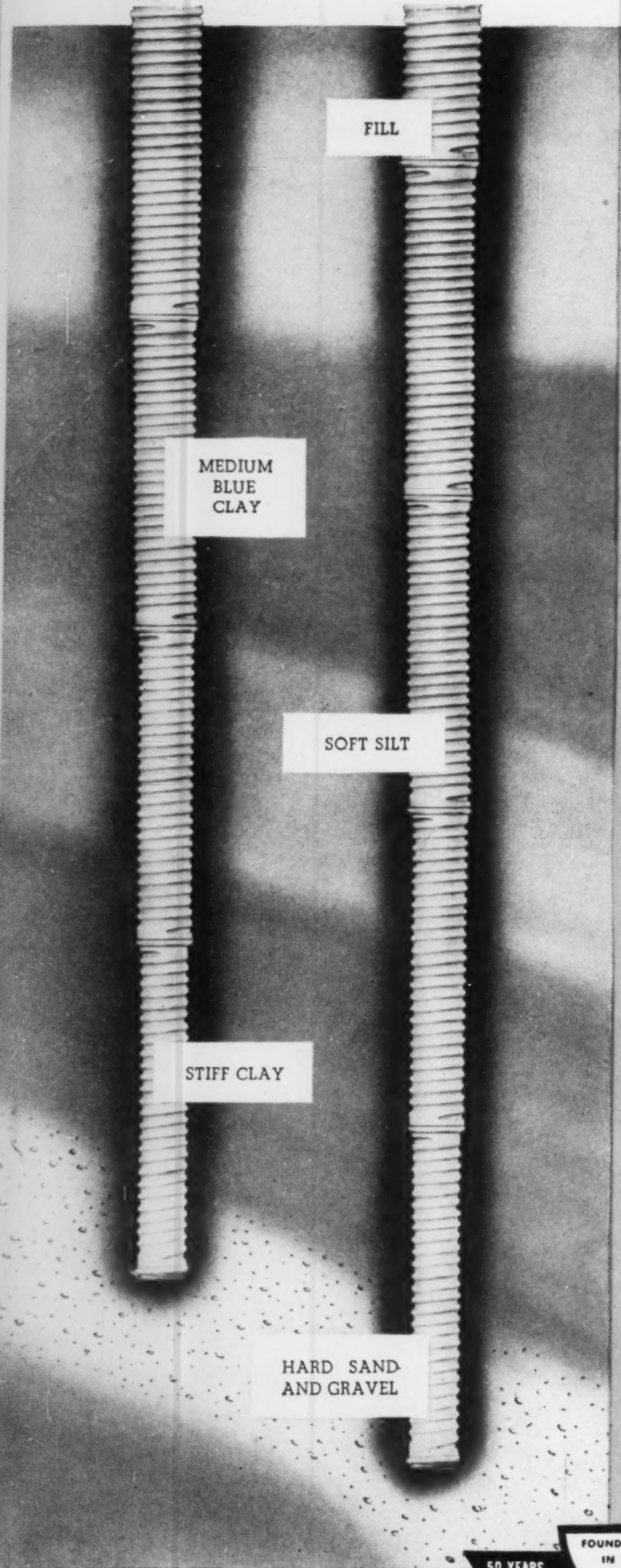
American Engineers Propose Jordan River Valley Plan

Abatement of Stream Pollution Requires Economic Justification

FALL MEETING

JACKSONVILLE, FLA.

Program page 13



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SEPTEMBER 1947
Volume 17 Number 9

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CIVIL ENGINEERING

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Original Woodcut by Lynd Ward

The modern community uses cast iron pipe in more ways than is generally realized. In addition to its better known use for water, gas and sewer mains in the streets of a community, U. S. Cast Iron Pipe is also used to furnish some or all of these utility services to such facilities as airports, golf courses, swimming pools and parks. U. S. Cast Iron Pipe is widely used, too, in water filtration and sewage treatment plants.

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Fall Meeting in Jacksonville, Fla.

Hotel Roosevelt to Be Headquarters, October 15-17, 1947
Program of Meetings, Entertainment and Trips

General Meeting—Wednesday Morning

8:30 **Registration**

10:00 **Fall Meeting called to order by**

Harold D. Van Vranken, M. ASCE, President of the Florida Section, American Society of Civil Engineers.

10:05 **Address of Welcome**

Hon. C. Frank Whitehead, Mayor of Jacksonville.

10:15 **Response**

E. M. Hastings, President, American Society of Civil Engineers.

10:25 **Address: The Work and Accomplishments of Engineers Joint Council**

Malcolm Pirnie, Past-President, ASCE, Consulting Engineer, New York, N.Y.

11:00 **Recess**

12:15 **Luncheon**

To be held jointly with members of Florida Engineering Society and Jacksonville Engineering Professions Club. Speaker at luncheon to be announced later. Ladies will attend this luncheon with the men. Tickets for luncheon, $1.75 per person.

Technical Division Sessions—Wednesday Afternoon

Structural Division

Jewell M. Garrelts, Secretary, Executive Committee, Structural Division, Presiding

Symposium on Structural Timber Prepared Under Direction of Committee on Timber Structures

2:00 **Grades and Grading of Structural Timbers**

W. H. O'Brien, Assoc. M. ASCE, Southern Pine Association, New Orleans, La.

2:30 **Postwar Timber Design, Construction and Working Stresses**

Frank J. Hanrahan, M. ASCE, National Lumber Manufacturers Association, Washington, D.C.

3:00 **Research Development in Timber Mechanics**

R. P. A. Johnson, Chief, Timber Mechanics Forest Products Laboratory, Madison, Wis.

3:30 **European Developments in Timber Design and Construction**

E. George Stern, Assoc. M. ASCE, Research Engineer, Virginia Polytechnic Institute, Blacksburg, Va.

4:00 **General discussion**

Waterways Division

Symposium on Tidal Rivers

W. W. DeBerard, Chairman, Executive Committee, Waterways Division, Presiding

2:00 **General Theory of Tidal River Phenomena as Illustrated by the Savannah River**

Ralph F. Rhodes, M. ASCE, Principal Engineer, U.S. Engineer Office, Savannah, Ga.

2:30 **The St. John's River Tidal Problems**

Harold A. Scott, Sr., Assoc. M. ASCE, Chief, Multiple Purpose Section, U.S. Engineer Office, Jacksonville, Fla.

3:00 **The Use of Hydraulic Models in the Solution of Problems in Tidal Rivers**

Henry B. Simmons, Engineer, Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss.

3:30 **Discussion opened by**

Clarence F. Wicker, Assoc. M. ASCE Chief, Engineering Division, Philadelphia District, Corps of Engineers, Philadelphia, Pa., bringing in the Delaware River as an example.

Earl I. Brown, M. ASCE, Colonel, Corps of Engineers, USA (Ret.), Southport, N.C.

Entertainment for Ladies

WEDNESDAY, OCTOBER 15

12:00 **General luncheon meeting**

For members and their wives.

4:00 **Reception and Tea at Clubhouse of Woman's Club of Jacksonville**

Visiting ladies will be the guests of the Jacksonville Woman's Club at the reception for the opening of the clubhouse for the fall season. The clubhouse is on the St. Johns River, about 2 miles from the Hotel Roosevelt. The Ladies Committee is arranging transportation.

There will be no charge for either the tea or the transportation.

Dinner, Entertainment and Dance, Wednesday Evening

HOTEL ROOSEVELT, BALLROOM

7:00 **Assembly**

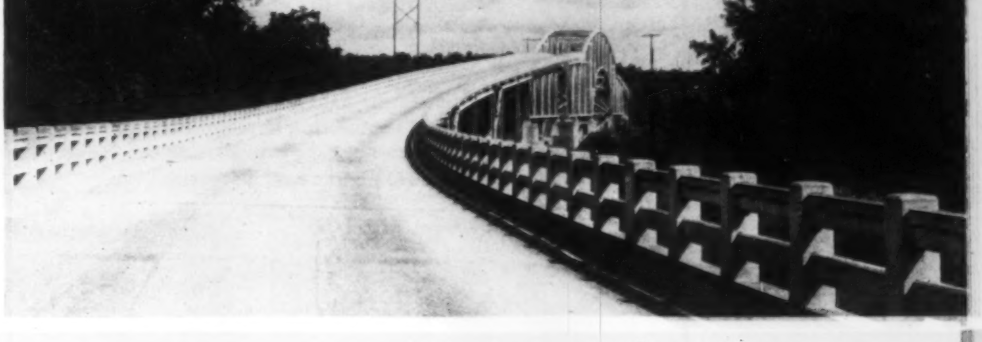
7:30 **Dinner**

After the dinner, there will be an address in which historical events that took place in and near Jacksonville and St. Augustine will be stressed.

Tickets for the dinner, $5.00 per person.

Informal—Men requested not to wear tuxedos and ladies requested not to wear long dinner dresses.

STEEL ARCH BRIDGE on Highway 500 over Apalachacola River between Bristol and Blounstown, Fla., 45 miles west of Tallahassee, is fine example of modern structural design.



Technical Division Sessions—Thursday Morning

Structural Division

Jewell M. Garrelts, Secretary, Executive Committee, Structural Division, Presiding

Symposium on Structural Timber Continued

9:00 Stress Distribution in Timber about Split-Ring Timber Connectors

A. G. H. Dietz, Assoc. M. ASCE, Assoc. Prof., M.I.T., Cambridge, Mass.; and Frank J. Mehringer, Assoc. Prof. of Mechanical Engineering, M.I.T.

9:30 Connector Research and Findings

J. H. Carr, Jr., Assoc. M. ASCE, Timber Engineering Co., Washington, D.C.

10:00 Wood Waterfront Structures

Ralph H. Mann, M. ASCE, American Wood Preservers Assoc., New York, N.Y.

10:30 Teaching Timber Mechanics and Design

Howard J. Hansen, Assoc. M. ASCE, Prof. of Mechanics and Acting Head of Industrial Engineering Dept., University of Florida, Gainesville; Chairman, Committee on Timber Structures.

11:00 General discussion

Sanitary Engineering Division

John H. O'Neill, Member, Executive Committee Sanitary Engineering Division, Presiding

9:00 A Review of Water Treatment in Southern United States

Malcolm Pirnie, Past-President, ASCE, Consulting Engineer, New York, N.Y.

9:30 Discussion

9:45 Lime Recovery in Miami Water Plant

Claude F. Wertz, Resident Engineer, Day and Zimmerman, Inc., Miami, Fla.

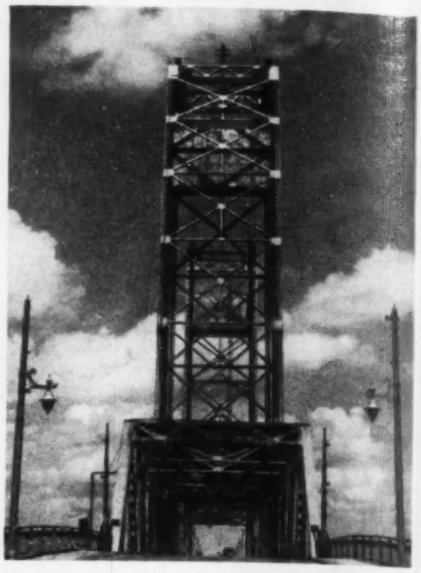
10:15 Discussion

10:30 Seawater Regeneration of Zeolite Water Treatment Plants

Charles Richheimer, M. ASCE, Engineer, Reynolds, Smith and Hills, Jacksonville, Fla.

11:00 Discussion

Wylie W. Gillespie, M. ASCE, Smith and Gillespie, Consulting Engineers, Jacksonville, Fla.



OLD LIFT BRIDGE in Jacksonville, Fla., over St. John's River, spans city's great inland deep-water harbor, which is largest on South Atlantic coast.

Luncheons on Thursday

12:00 Ladies' Luncheon

Ladies will leave the hotel at 12:00 noon for luncheon at the Timuquana Country Club, after which they will be free to play golf, cards, etc., returning to the hotel about 4:00 p.m.

Tickets, including transportation, are $1.75 each.

12:30 Luncheon for Men, Hotel Roosevelt

Speaker to be announced. Tickets are $1.75 each.

Cocktails, Buffet Supper, Bingo—Thursday Evening

6:30 Assembly—Main Ballroom—Hotel Roosevelt

Tickets, $5.00 per person.

Sessions of Technical Divisions—Thursday Afternoon

City Planning and Highway Divisions

COMBINED SESSION

Charles M. Upham, Chairman, Executive Committee, Highway Division, Presiding

Planning the Location and Function of Federal-Aid Urban Highways

2:00 Travel Habit Surveys for Planning Transportation Systems

E. H. Holmes, Chief, Division of Highway Transport Research, Public Roads Administration, Washington, D.C.

2:30 The Interstate Highway Through Jacksonville

W. M. Parker, Division Engineer of Research and Records, Florida State Road Department, Tallahassee, Fla.

3:00 Discussion

Frank H. Malley, Chairman, Executive Committee, City Planning Division.

Sanitary Engineering Division

John H. O'Neill, Member, Executive Committee, Sanitary Engineering Division, Presiding

2:00 Pan American and South American Developments in Sanitary Engineering

Clarence Sterling, Chief Engineer, Health and Sanitation Division, Office of Inter-American Affairs, Washington, D.C.

2:30 Developments of Sanitary Engineering Research Facilities in Florida

C. D. Williams, M. ASCE, Head Professor of Civil Engineering, University of Florida, Gainesville, Fla.

David B. Lee, Chief Sanitary Engineer, Florida State Board of Health, Tallahassee, Fla.

3:00 The Program of the National Council for Stream Improvement for Pollution Abatement in the South

W. A. Maggeo, Research Associate, Engineering Experiment Station, Louisiana State University, Baton Rouge, La.

3:30 General discussion

Construction Division

Rear Admiral Kirby Smith, Chairman, Executive Committee, Construction Division, Presiding

2:00 Construction of the Rickenbacker Causeway

E. M. Rader, County Engineer, Dade County, Florida.

Discussion

2:30 Clear, Precise Specifications and Contracts Invite Lower Bids

George B. Hills, M. ASCE, Consulting Engineer; and Charles F. Lovan, M. ASCE. Hillyer and Lovan, Contractors, Jacksonville, Fla.; President, Northeast Florida Chapter, Associated General Contractors of America, Inc.

Discussion

3:00 The Building Research Advisory Board—Its Past and Future

R. H. Tatlow, III, M. ASCE, Chairman, Construction Division Committee on Construction Planning; President, Abbott Merkt and Co., Engineers, New York, N.Y.

3:30 General discussion

Excursions on Friday, October 17

9:00 **Excursion to Marineland and return via St. Augustine**

Members and ladies will board buses at Hotel Roosevelt at 9:00 a.m. in order to arrive at Marine Studios in time to see the fish and porpoises fed at 11:00 a.m.

12:30 **Luncheon** will be served at 12:30 and the buses will then proceed to St. Augustine where visits will be made to the Alligator Farm, Fort San Marco, The Fountain of Youth and some of the very old houses.

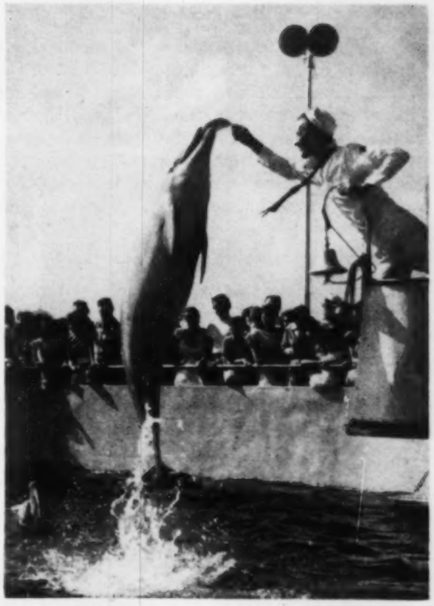
Tickets for the trip, $5.50 per person. This includes transportation, lunch and all admission charges.

Another excursion will be arranged to visit the University of Florida at Gainesville and inspect the new experimental sewage disposal plant being constructed there. This latter trip will, however, be arranged only if there is sufficient demand for it.

There are many establishments in Jacksonville at which cars can be rented without drivers, the rental being based on a mileage charge. The Local Committee will furnish information to visitors and assist them in getting cars for any of these trips.

There are many points of interest within reasonably short drives from Jacksonville. Some of these with their distances from Jacksonville are given below:

Place	Miles from Jacksonville
Atlantic Beach	17
Jacksonville Beach	20
Ponte Vedra Beach	25
U.S. Naval Air Station	10
U.S. Navy Reserve Fleet Base, Green Cove Springs, Fla.	25
University of Florida, Gainesville, Fla.	75
Silver Springs, Ocala, Fla.	100
Naval Stores Experiment Station, Olustee, Fla.	45
Fernandina and Fort Clinch	35



MARINE STUDIOS, world's only oceanarium—housing 10,000 undersea specimens—is center of attraction for thousands of visitors to Florida each year. Feeding scene at upper right shows 350-lb porpoise in mid air taking choice morsel of food from attendant. Excursion on Friday, October 17, reaches Marineland in time to see fish and porpoises fed at 11:00 a.m. Large view shows Florida's super-aquarium as seen from the air.

Hotel Accommodations and Announcements

Information

An information desk will be maintained at the headquarters, Hotel Roosevelt, for the convenience and assistance of visiting members and guests. Mail will be delivered to the addresses at local hotels, if known; otherwise it will be held at the information desk. Undelivered mail will be forwarded at the close of the meeting.

Make Hotel Reservations Early

On account of the crowded hotel situation, members are urged to make their hotel reservations well in advance of the meeting by writing to Russell H. DeGrove, Chairman, Hotel and Registration Committee, c/o Tourist and Convention Bureau, 307 Hogan Street, Jacksonville 2, Fla.

Hotel Rates

	Single Room		Double Room	
	With Bath	Without Bath	With Bath	Without Bath
Hotel Roosevelt	3.00 up	..	5.00 up	..
Hotel Seminole	3.50 up	..	6.00 up	..
Hotel Windsor	3.00 up	..	5.00 up	..
Hotel Aragon	2.50 up	2.00	5.00 up	4.00
Hotel George Washington	3.50 up	..	6.00 up	..
Hotel Mayflower	3.50 up	..	6.00 up	..
Hotel Floridan	2.50 up	2.50	4.00 up	4.00
Hotel Windle	3.00 up	2.00	4.50 up	3.00
Hotel Andrew Jackson	3.00 up	2.00	5.00 up	3.00

Most of the hotels have excellent accommodations for parties of three or more.

Local Section Conference

A conference of representatives of Local Sections will be held Monday and Tuesday, October 13 and 14, 1947, at the Hotel Roosevelt. The program will be a continuation of the policy adopted for Local Sections by the Society. All representatives are expected to participate. Members are welcome to attend and observe at these meetings.

Student Chapter Conference

A Student Chapter Conference will be held on Tuesday, October 14. The students attending the conference are all invited to attend the rest of the meeting. The local committee is making room arrangements for students at rates considerably lower than the hotel rates as published.

Committees for 1947 Fall Meeting

Local Committee on Arrangements

Entertainment features and technical programs are under the direction of the Local Committee. The members of the Florida Engineering Society and the Engineer Professions Club of Jacksonville have offered their services to the Local Committee, and many members of those organizations have been placed on various subcommittees. The Executive Committee is composed of the chairmen of the various subcommittees.

Executive Committee

Robert M. Angas	Chairman
Harold D. Van Vranken, Pres., Florida Section, ASCE	Vice-Chairman
Prof. Clifford D. Williams	Technical Programs
Russell H. DeGrove	Hotel & Registration Committee
Wylie W. Gillespie	Luncheon, Dinner and Dance Committee
John F. Reynolds	Excursion and Entertainment Committee
Alexander Brest	Finance Committee
William Buecheler	Publicity Committee
Harrison D. Comins	Student Activities Committee
Mrs. Robert M. Angas	Hostess Committee

District 10 Committee

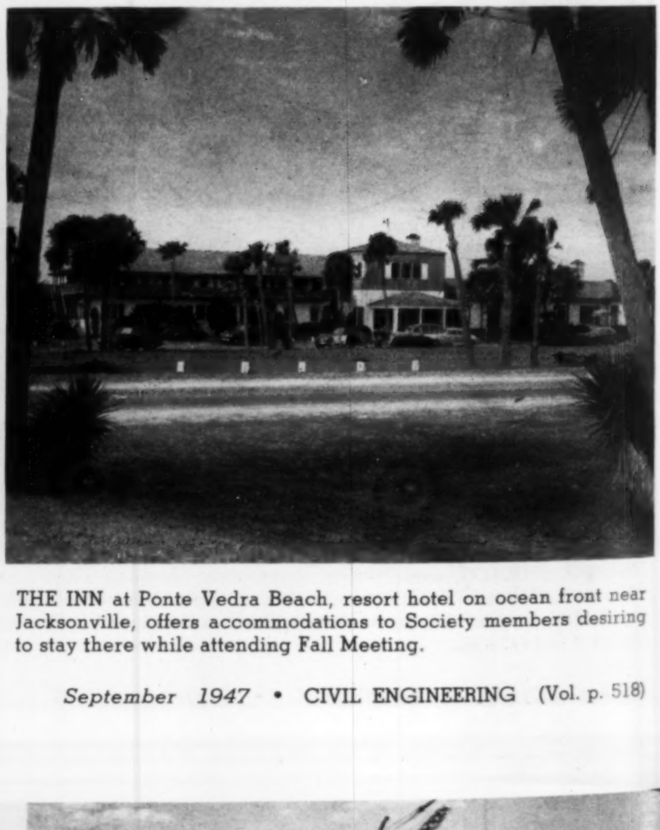
The following presidents of the Local Sections in District 10 have been appointed to serve on a District Committee:

Presidents	Local Sections
Harold D. Van Vranken, Chairman	Florida
John F. Tribble	Alabama
Robert O. Harris	Georgia
Claude F. Wertz	Miami
Donald A. du Plantier	Nashville
N. P. Hayes	North Carolina
C. P. Roberts	South Carolina
Lewis A. Schmidt, Jr.	Tennessee Valley

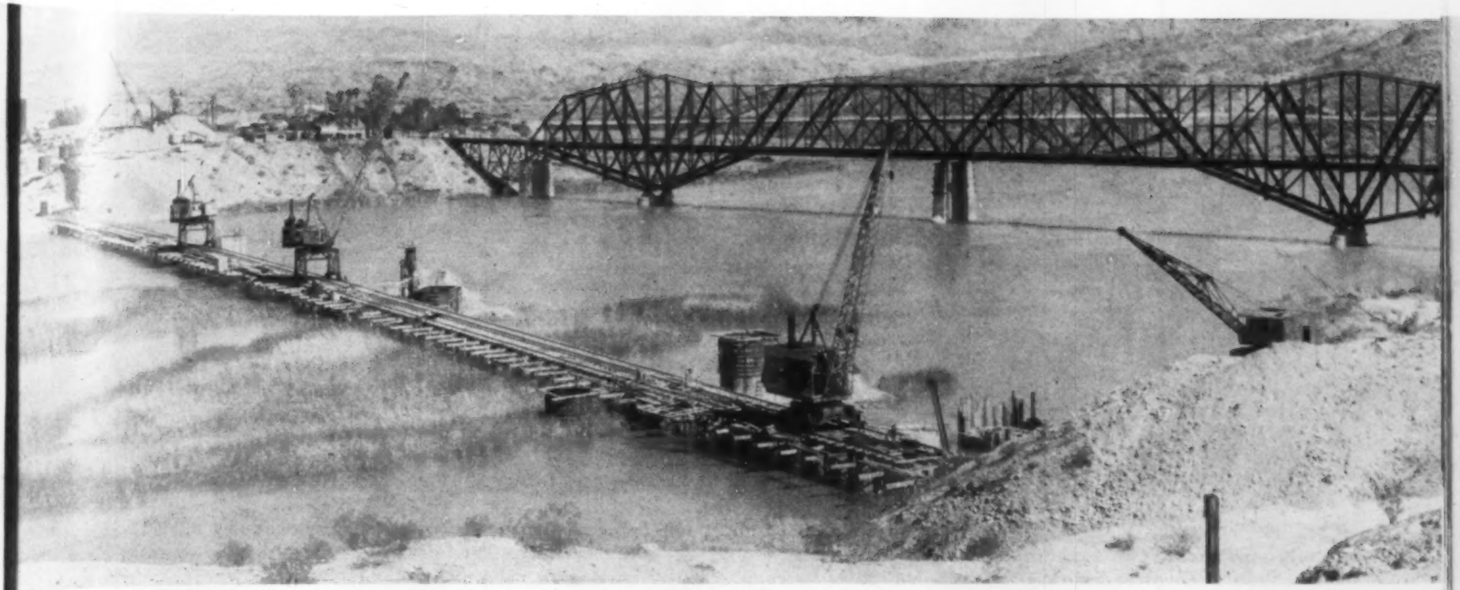
Hostess Committee

Mrs. Robert M. Angas, Chairman
Mrs. Harold D. Van Vranken
Mrs. H. D. Mendenhall
Mrs. Harold A. Scott
Mrs. R. W. Cloues
Mrs. George P. Hills
Mrs. Selwyn S. Jacobs
Mrs. Morrice Protheroe
Mrs. W. A. Smith
Mrs. Ralph E. Spalding
Mrs. George W. Simons, Jr.
Mrs. Charles F. Lovan
Mrs. Wylie W. Gillespie
Mrs. Blase Nemeth
Mrs. Miles H. Thomas
Mrs. David B. Lee
Mrs. John B. Miller
Mrs. N. C. Farmer
Mrs. Charles E. Richheimer
Mrs. Gilbert A. Youngberg
Mrs. A. H. Brown
Mrs. Russell H. DeGrove
Mrs. Russell P. Redman

WOMEN'S CLUB of Jacksonville, on bank of St. Johns River, invites visiting ladies to reception and tea on Wednesday, October 15, occasion which marks inauguration of club's fall activities.



THE INN at Ponte Vedra Beach, resort hotel on ocean front near Jacksonville, offers accommodations to Society members desiring to stay there while attending Fall Meeting.



TEMPORARY 1,700-FT TRAMWAY erected for construction of piers for Santa Fe railroad bridge over Colorado River, near Topock, Ariz., carries three gantry-type cranes on rails spaced on 18-ft centers. Tramway also carries dinky railroad for transportation of materials. Crane at left is working at Pier 3, deepest of four main piers. Starting at east bank, in background, piers are numbered from 1 to 6.

Deep Cylinder Piers Support

Heavy Steel Trusses of Bridge Over Colorado River

WALTER E. ROBEY, M. ASCE

Bridge Construction Engineer,
Atchison, Topeka & Santa Fe Railway System, Chicago, Ill.

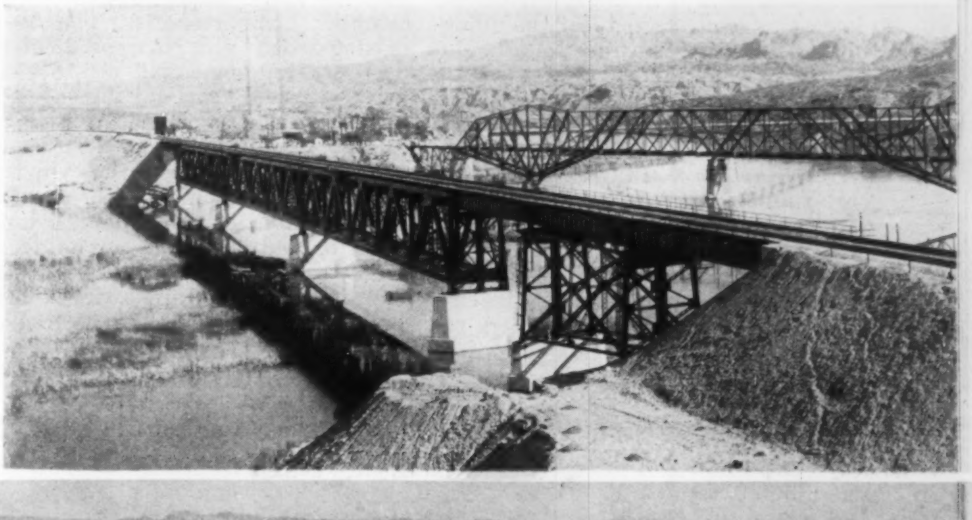
FOLLOWING THE PRECEDENT set in 1890 by the Red Rock Bridge, at that time the largest railroad cantilever in the United States, the Santa Fe has again made engineering history at the same crossing of the Colorado River. Foundations of the new bridge near Topock, Ariz., include the deepest pneumatic pier ever constructed in the United States through water-bearing material. Construction of pier foundations to carry the heavy superstructure required the pouring of 17,400 cu yd of concrete and excavation by open-dredging and pneumatic-caisson methods to a depth of 125 ft below the river level. A special ruling of the Arizona Industrial Commission permitted the use of 52 psi air pressure for this work, 2 lb over the state safety code limits. The new structure was opened to traffic in March 1945, following a construction period of 2½ years.

PLANNING AND CONSTRUCTION of the project was under the direct supervision of G. W. Harris, M. ASCE, chief engineer of Santa Fe System Lines in Chicago. The bridge design was under R. A. Van Ness, M. ASCE, bridge engineer of the system lines, Chicago. Construction details were under the direction of M. C. Blanchard, M. ASCE, chief engineer of the Santa Fe Coast Lines at Los Angeles. Substructure contractor was the Kansas City Bridge Co., and fabrication and erection of the superstructure were done by the American Bridge Co.

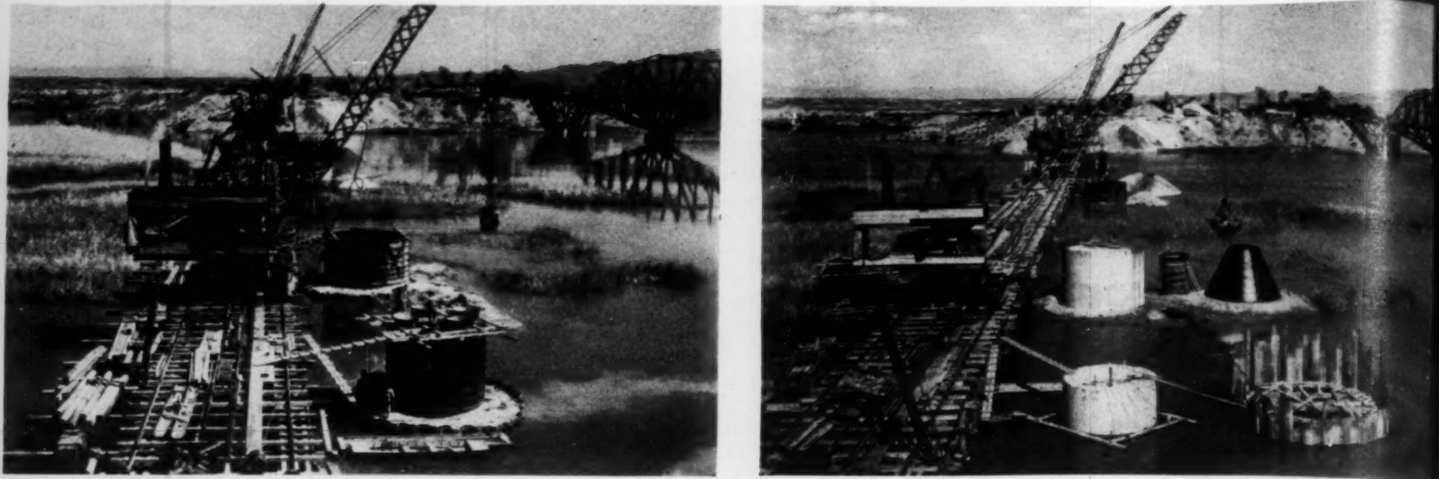
DESIGNED FOR MODERN railroad loadings, the new double-track, deck-type bridge across the Colorado River on the main line of the Santa Fe Railroad at Topock, Ariz., provides better alignment, grade and safety from structural failure of the through-type trusses caused by derailments.

The 1,507-ft crossing, 400 ft upstream from the old cantilever structure, consists of three 350-ft simple deck truss main spans with a 50-ft-wide flange beam, a 100-ft deck-plate-girder east approach span, and three 100-ft deck-plate-girder west approach spans.

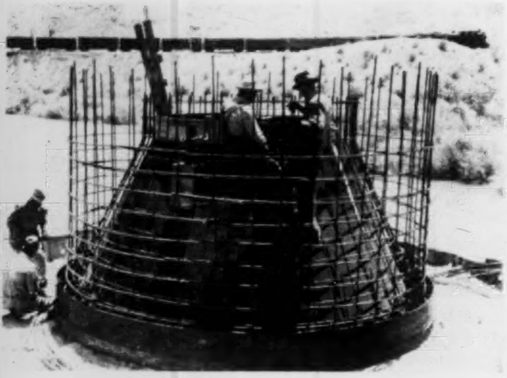
The grade line of the bridge was laid at sufficient elevation to permit the use of deck-type trusses. A 0.5 percent grade, ascending westward, saved considerable excavation in the rough terrain on a 4½-mile section of the west approach. By improving the alignment of the new location, the designers eliminated the 10-deg curve required at the west end of the old bridge.



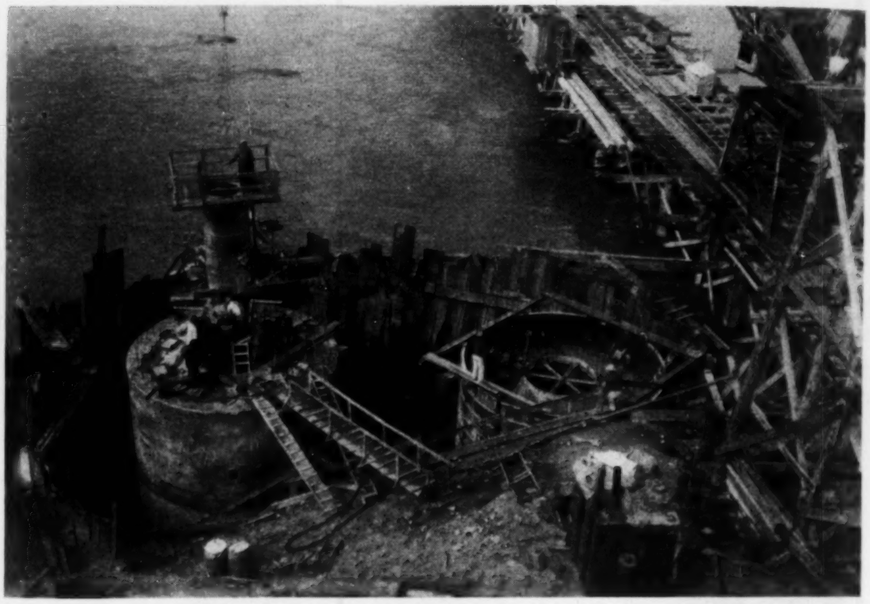
DECK-TYPE CONSTRUCTION prevents possibility of structural damage from derailments and possible failure of through-type trusses. New bridge designed for modern railroad loadings replaces old modified cantilever structure in background, which has been turned over to state highway departments for conversion to vehicular traffic.



CONCRETE FOR NORTH CYLINDER of Pier 6 (foreground of photo at left) is placed by means of crane and bottom-dump bucket. Hoppers and elephant trunks control distribution of pour. Photo at right shows north cylinder of Pier 6 (left foreground) landed on solid material and ready to be plugged for air. Sheetpile cofferdam forms sand island for start of south cylinder. Cylinders of Pier 5 in background started on sand bar.



CUTTING-EDGE REINFORCING STEEL of 16-ft-dia south cylinder, Pier 6, is placed preparatory to adding outside steel form. Dredge well opening of 8-ft dia is same for all cylinders.



AIR LOCKS ARE INSTALLED on south cylinder of Pier 2 before cofferdam is allowed to flood and pneumatic method is used for driving cylinder to bedrock. Absence of overburden and slope of rock on east bank require semicircular cofferdam consisting of double row of sheetpiling with concrete tremie seal between. Bottom of dewatered cofferdam leveled sufficiently to set cutting edges and make working chamber and cylinder pour.

Test borings at the pier locations were made to provide data for design of foundations. Diamond-drill core samples revealed that the rock in the river bed was identical with the breccia outcroppings on the west bank, capable of safely carrying a design load of 25 tons per sq ft. Scour was figured to bedrock, and all traction and braking forces from moving live loads were assumed to act on the fixed shoes.

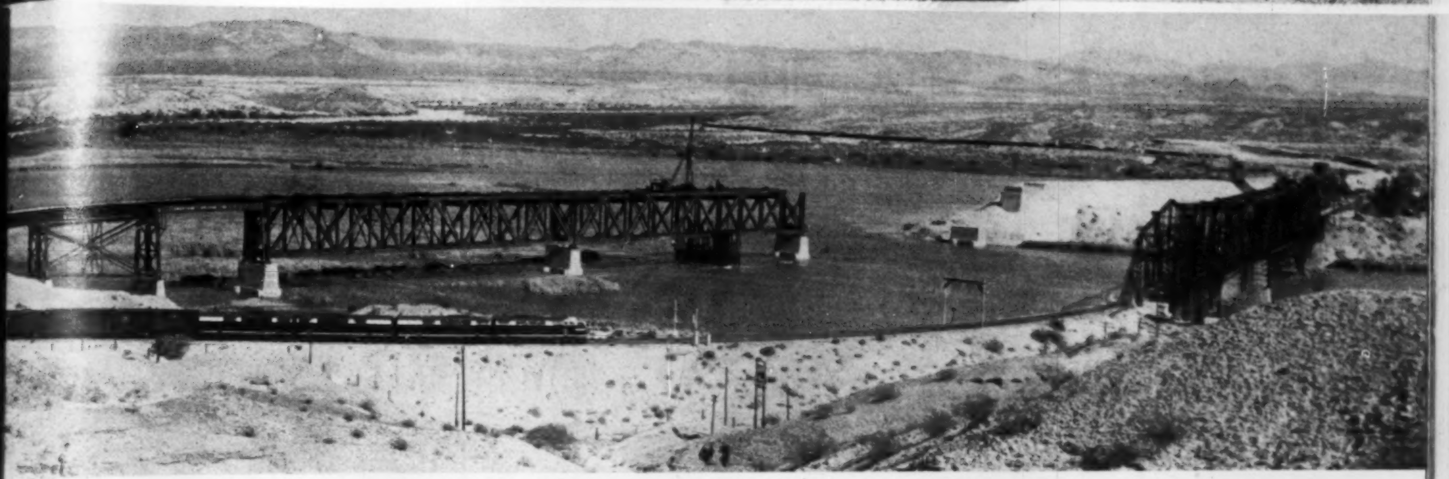
Twin Cylinders Sunk

A temporary tramway 1,700 ft long was constructed for handling materials used in the foundation work. Twin cylinders were sunk to support each abutment and pier. For the river piers, the tops of these cylinders extend 5 ft above the normal river elevation and the two cylinders are connected at the top with a 10-ft-deep web wall, the bottom of which extends 5 ft below river level.

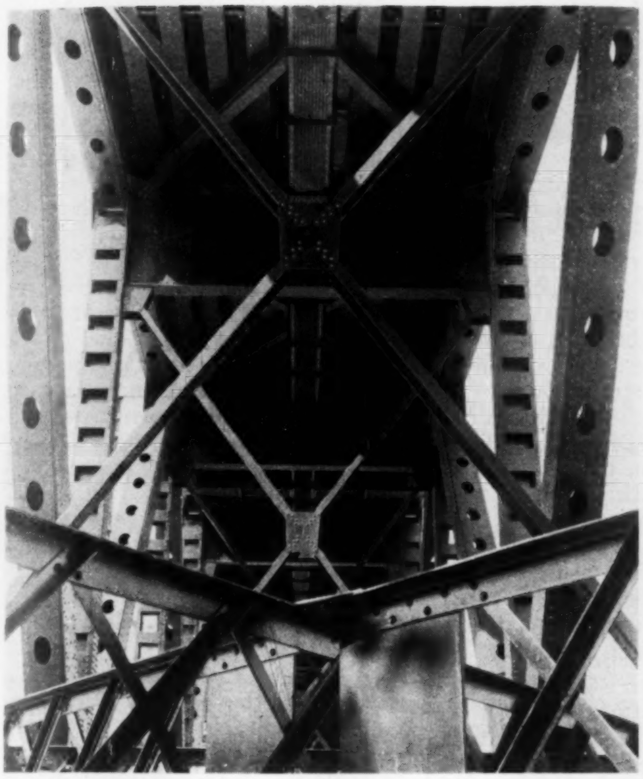
For all river cylinders the sand-island method of sinking was employed. Varying design of piers required the use of cylinders of varying diameters of 14, 16, 22, and 24 ft. The dredge well in each cylinder was 8 ft in diameter and steel forms were used for the cylinders and working-chamber compartments. The steel cutting edge was composed of a $6 \times 6 \times {}^1/_2$-in. angle and an $18 \times {}^3/_8$-in. steel plate. The cutting edges of all cylinders are embedded a minimum of 6 in. in rock, and the excavation, for the full size of the cylinder, extends 2 ft below to form a shear key. Cylinders were supported on three or four stools of rock and concrete poured under their cutting edges to receive full bearing. Test holes were drilled in the bottom of each cylinder excavation to verify the extent of solid rock.

Pouring Requires Unusual Pressure

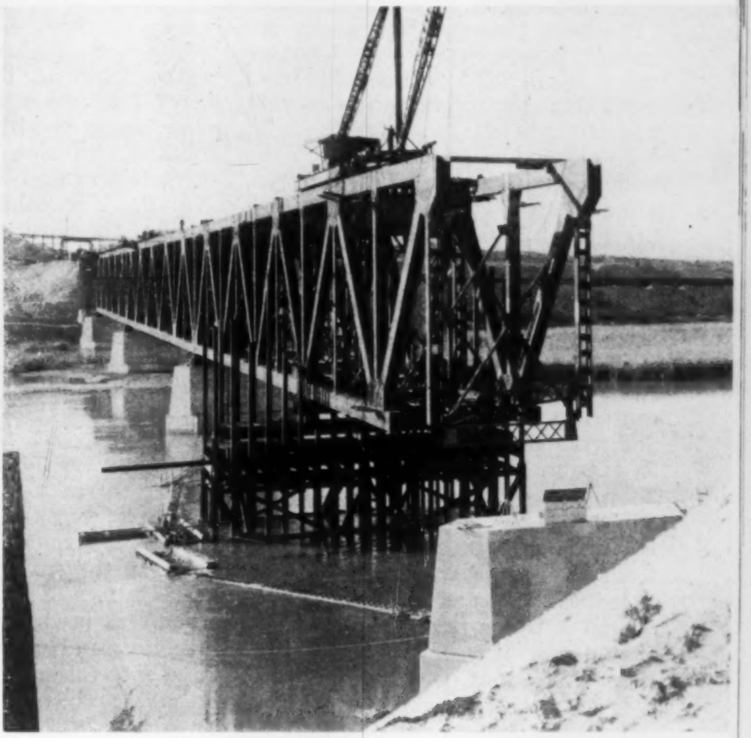
Pier 3, constructed in a 30-ft depth of water, requiring sheet-piling 60 ft long for the cylinders, was the deepest of the four main piers. Its north and south cylinders were carried, respectively, 100 and 115 ft below river level by open dredging. They were then plugged and driven further by the pneumatic process until they landed in bedrock 123 ft below the river level, the keyway extending 2 ft deeper. The 52-psi air pressure used when the seal concrete was poured required a special ruling of the



ALIGNMENT OF WEST APPROACH to old gauntlet track cantilever crossing of Colorado River (above) is on 10-deg curve. Longer and higher new double-track bridge rectifies this undesirable feature.



VIEW OF UNDER SIDE of deck (above) shows stringers, inspection catwalk (at center of photo), heavy truss members and bracing. Design, materials, and workmanship follow AREA specifications. Top and bottom chords consist of 42-in.-deep webs, four 8×6-in. angles and 25-in.-wide cover plates, with bottom plates perforated. Intermediate floor beams have 96-in.-deep webs with 8×8-in. flange angles and 18-in.-wide cover plates. Top laterals are 14-in.-wide flange beams. The bridge contains 6,500 tons of steel.



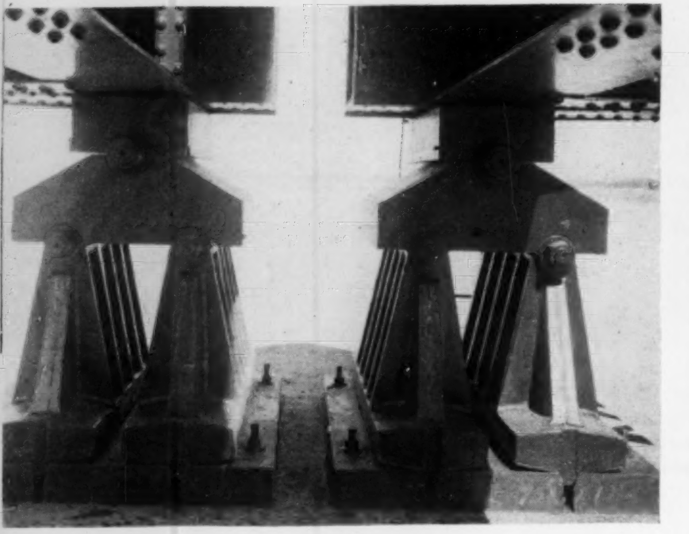
ERECTION OF TWO easterly trusses (above) requires use of one steel bent per span for temporary support. Falsework consists of 40 steel piles driven in 25 ft of water and braced against strong current near east bank by prefabricated cage which extends well below water level.

Arizona Industrial Commission, since maximum pressure is limited to 50 psi by provisions of the state safety code.

For the deep cylinders at Pier 3, the seal concrete was poured and puddled by sand-hog labor until it was about 1 ft above the cutting edge. Concrete for this operation was lowered through the air locks in 0.4-cu yd muck buckets. The rest of the air seal was poured through the locks 2 cu yd at a time. This method was employed since a 52-lb pressure did not completely dry up the bottom and it was necessary to draw off excess water until the concrete was above the cutting edge. Seal concrete for all other cylinders was poured through the air lock, since their bottoms were perfectly dry.

Air Cooled by River Water

Pneumatic work, on a 24-hour per day schedule, lasted for a total of 350 days, the contractor employing from 50 to 60 sand hogs. Summer desert heat of 120 deg required special cooling of the air pumped into the working chambers. Cooling was accomplished by placing the 5-in. air line extending along the construction trestle in a trough of cold river water. Exposed man locks were covered with burlap and sprinkled with water. The man-lock and material-lock shafting in the 8-ft-dia dredge wells was 36 in. in diameter. The man lock usually consisted of two or more 10-ft lengths of shafting which permitted a gang of eight men to be locked out at one time. A hospital



TWO EXPANSION SHOES are required at Pier 3 because of its extreme height. Shoes designed for load of 3,100 kips are placed for two easterly truss spans to eliminate horizontal forces. Since track is on grade, nominal horizontal force is assumed for design. Top bearing slab measures $18\times10\times44$ in.; top pin has 4-in. dia. Other measurements include distributing slab, $36\times14\times44$ in.; rocker pins, 3-in. dia; rockers, 16 in. wide, 30 in. high, and 70 in. long; bearing slab, $48\times5^1/_2\times70$ in.

lock was provided on the job; however, there were very few severe cases of the bends.

Total concrete poured in the foundations was about 17,400 cu yd. All concrete was designed to develop a strength of 3,000 psi except the seal concrete, which was 2,000-lb.

Erection of Superstructure

The three 350-ft deck trusses are of the Warren type with panels 34 ft $7^1/_2$ in. long. The distance from center to center of chords is 46 ft, and from center to center of trusses, 28 ft. Each track is carried on four 33-in. wide-flange beams weighing 220 lb per ft. Two traction trusses in each span transmit longitudinal train braking or starting forces into the truss top lateral system.

One of the striking features about these trusses is their neat and streamlined appearance, which is due to the boxed sections of the main members. All angles on chord and web members are turned inward, giving a smooth appearance from the outside. All chord and diagonal members composed of plates and angles have solid top cover plates and perforated bottom cover plates. These perforations are elliptical openings 12×20 in., large enough for a man to crawl through, and spaced approximately 4 ft 6 in. on centers.

Mill and shop inspection of all steel was done by an inspection firm employed by the railway company. All steel was shipped to the job without paint, and no fitting-up paint was used.

For coordination with the foundation work and with construction of the east approach, erection of the superstructure proceeded from the west bank eastward. The westerly 350-ft truss span was erected on timber falsework in the normal manner. The other two truss spans were erected by the cantilever method, utilizing one intermediate steel falsework bent at panel point No. 6. The falsework bent under each of the trusses consisted of forty 12-in. 65-lb steel pile sections braced with a prefabricated steel cage.

Permanent bridge stringers were used as temporary falsework grillage during erection. The calculated load on the steel piles during erection was 60 tons, and the deepest penetration was 65 ft. At the location of the falsework for the most easterly truss, the river was 25 ft deep, and the steel frame holding the piles extended well below the river level to brace the piles in the strong current along the east bank. The top-chord tieback members used during the cantilever erection and other weight increases due to erection stress added 56 tons of steel to the total used on the job.

A creosoted-timber, ballasted deck 28 ft wide supports the double-track 131-lb rails on 7×9-in. by 9-ft hardwood ties. Walkways 2 ft wide extend the full length of the bridge on both sides. Conveniently spaced track car setoffs are provided on each track. The creosoted walkway timber is covered with one layer of unsaturated asbestos felt $^1/_{16}$-in. in thickness and by asphalt plank 1 in. thick as a fire protection, and all exposed ballast curbs are covered with 26-gage sheet metal. An inspection walk extends the full length of the bridge beneath the timber deck, except under the beam span at the east end of the bridge.

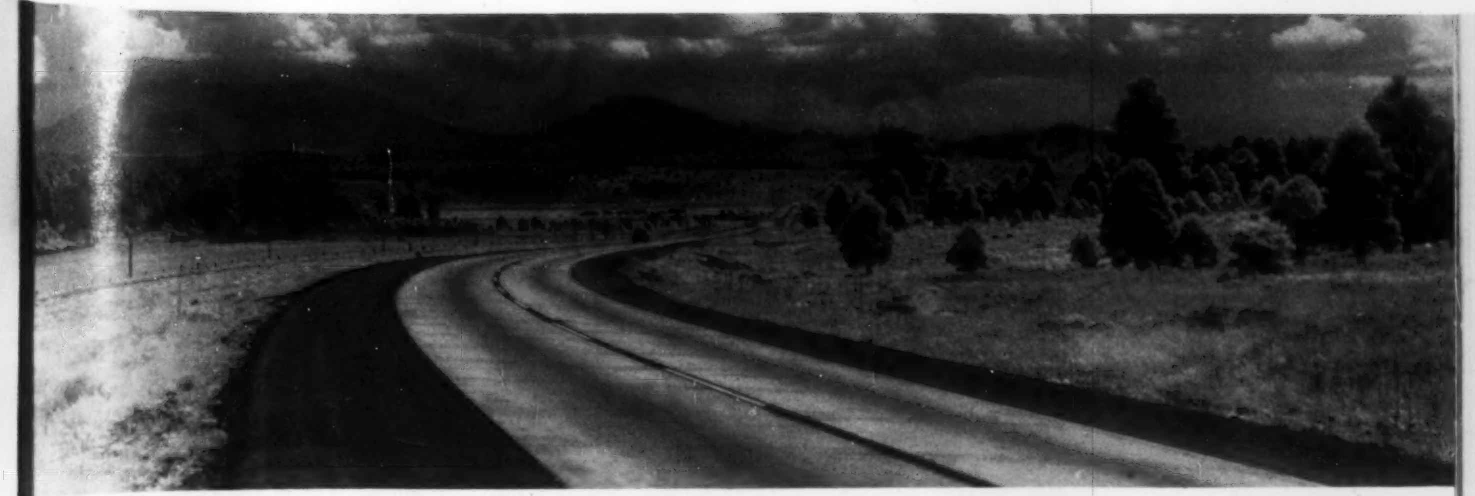
A series of stress tests are being conducted on this bridge by the research department of the Association of American Railroads. A check of theoretical dead-load stresses is being made, the no-load gage holes having been drilled in the truss members at the fabricating shop. Tests to be made include measurement of secondary stresses in gusset plates, also live-load and impact stresses in main truss members.

Excavation and Embankment Work

Grading of the west approach required 1,104,000 cu yd of excavation and the placing of 1,001,000 cu yd of embankment. On this portion of the project it was necessary to construct 23 drainage structures and two highway underpasses. The largest of 14 concrete arches required for these structures is 22 ft wide, 9 ft from springing line to flow line, and 107 ft long. Other structures included in this approach work are four ballasted deck timber trestles averaging 112 ft in length, and five creosoted wood boxes.

To conserve man-hours during the war period, the east approach was built on a 5-deg curve and a 1 percent grade ascending westward, as an alternate to a longer and more costly approach. This short approach—$^3/_4$ mile long—required 278,000 cu yd of embankment and 76,000 cu yd of excavation. One highway underpass was required as well as extension of several existing drainage structures.

FIRST OF THREE permanent bridges built in the Needles area was a timber structure consisting of a series of 80-ft truss spans with a draw span over the channel and pile trestle approaches on each end. This bridge replaced a temporary crossing of trestle construction. In spite of severe washouts occasioned by its unfavorable location, the bridge remained in service from 1883 to 1890, when it was replaced by a high-level cantilever of iron and steel named the Red Rock Bridge. This 990-ft-long, single-track structure was, at the time of its construction, the largest railroad cantilever bridge in the United States. Designed by J. A. L. Waddell, Hon. M. ASCE, and erected by the Phoenix Bridge Co., it was described by S. M. Rowe, M. ASCE, in the TRANSACTIONS of ASCE (Vol. 25, 1891, pages 662–728). In 1910 it was reinforced by adding a pier at the center of the suspended span and by other revamping of the superstructure. This bridge was donated to the California and Arizona state highway departments and is in use as a highway bridge, replacing a nearby highway span of light design. An article by R. Robinson Rowe, M. ASCE, senior bridge engineer, California Division of Highways, on transformation of the modified cantilever into a highway bridge, is scheduled for publication in the October issue of CIVIL ENGINEERING.



MOST HEAVILY TRAVELED highway in Arizona, U.S. 66, provides example of practically every problem confronting state highway engineers. About 51 miles, including new concrete pavement (above) between Williams and Flagstaff, has been rebuilt to handle speeds of 60 to 70 mph. Almost $^3/_4$ of the road's 383-mile length must be retired without salvage.

Economic Justification of Highway Improvements Confronts Arizona

E. V. MILLER, Assoc. M. ASCE

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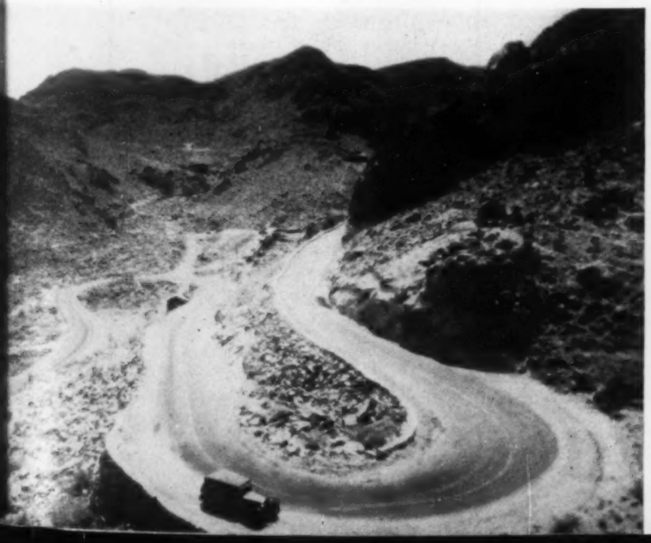
IN THIS NEW ERA of highway construction the most important problem confronting the Arizona highway administration is the economic justification of highway improvements and the placing of priorities on a reconstruction program for the highway system, consistent with anticipated revenues. Arizona's immediate concern is with the present state primary and secondary system. To improve these two systems to modern standards, estimates indicate an expenditure of about 100 million dollars. Anticipated revenues seemed to preclude any more than about 3 millions per year of state funds for construction. This amount matched with federal funds of about $4^1/_2$ million dollars would give $7^1/_2$ million per year, or a 13-year program. The Highway Act of 1944 gave the state a total of $5,728,000 per year for the three postwar years, but the counties are taking up about one million per year and $262,000 is set aside for urban highways, which leaves about $4^1/_2$ million of federal aid for the state.

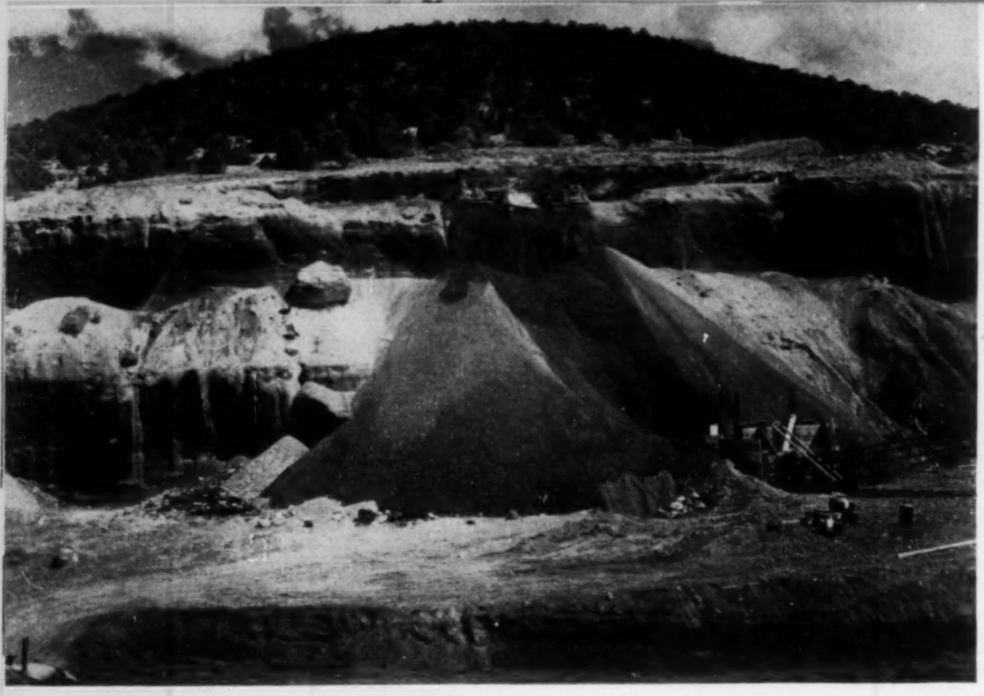
WORLD WAR II will reflect a gap between two definite eras of highway construction in Arizona—the second and the third. The first era started after World War I when the present basic highway system was laid out. There followed ten or twelve years of highway construction designed to link main centers of population and county seats with all-weather gravel surfaced roads. The second era started with the advent of the oiled road or low-type bituminous surface. Gravel roads were designed primarily to get the traveler out of the mud, and the oil was to lay the dust.

The third era may not be too well defined as yet because Arizona is still striving to catch up with its deferred prewar construction program. There is, however, a definite trend toward considering the highway system a

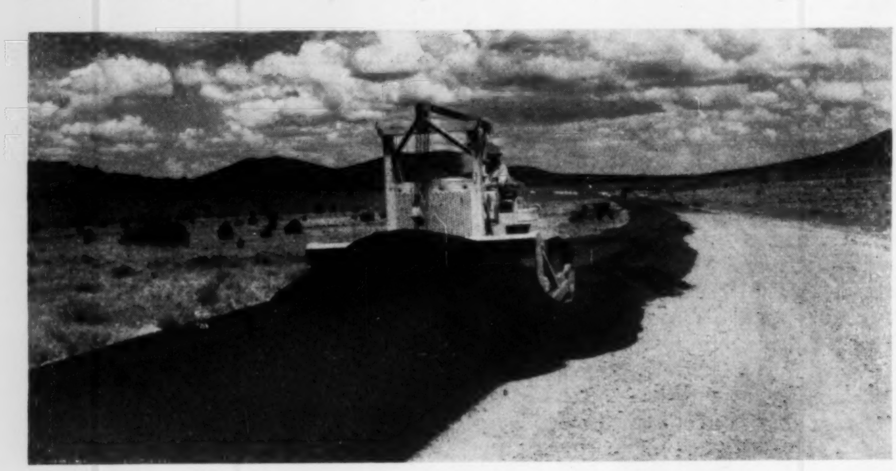
SHARP CURVES, steep grades and narrow rights-of-way make much of Arizona's present highway system obsolete. Portions of present roads will serve as detours until modernization can be completed. Section of U.S. 66 (below) near Oatman and Gold Roads shows need of realignment. Curve nearest camera, on steep grade, has 34-ft radius.



POSTWAR HIGHWAY PROGRAM for Arizona gets under way with modernization of state primary and secondary roads. Tractor and rooter (below) start 38-ft cut on highway U.S. 80 near Bisbee. Approximately 10 ft of rock soil was removed by this method before solid rock was hit. Drilling and shooting were required to reach final grade.



VOLCANIC CINDERS FOR ROAD BASE and oil-mix material for resurfacing part of Grand Canyon–Old Trails Highway, Kaibab National Forest, Ariz., are pushed from hillside to crusher (above) by D7 and D8 tractors with bulldozers. Subbase and surfacing of 10.59 miles of main road (below) between Williams, Ariz., and Grand Canyon require 100,000 cu yd of this material.



part of the economic structure of the state. If the revenues derived from the highway system are an economic benefit, then highway expenditures should be correlated with them. This is the present and future problem in planning the reconstruction of the Arizona highway system.

Engineering problems during the first era were relatively simple, but in the oil era they became real. During this period prior to World War II, it was not only the technical problems relating to road bases and pavements but increased traffic volume and increased speed that emphasized the problem of design. The dust on our original system had hardly been laid when we were confronted with problems of reconstruction due to obsolescence in design.

World War II gave Arizona highway engineers a breathing spell to take inventory and do some planning. Highway planning survey records revealed that of the 2,458 miles of primary highway system, nearly 60 percent had become inadequate by virtue of increased traffic requirements. Apparently at that time the deficiencies were more or less based on traffic volumes versus widths. The Arizona Highway Department has long felt that some other method should be used to measure the sufficiency or deficiency of highways.

Report Gives Sufficiency Ratings

The Arizona planning survey (with Public Roads Administration planning engineers) has just made the first step in this direction. A report has recently been made covering the primary federal-aid system in Arizona which gives a sufficiency rating for each highway. The report presents a breakdown that reveals even spot location of deficiencies, and rates each highway or portion thereof, using factors of design such as width, curvature, sight distance, surface type, surface condition and marginal influence, all in relation to traffic volume and speeds.

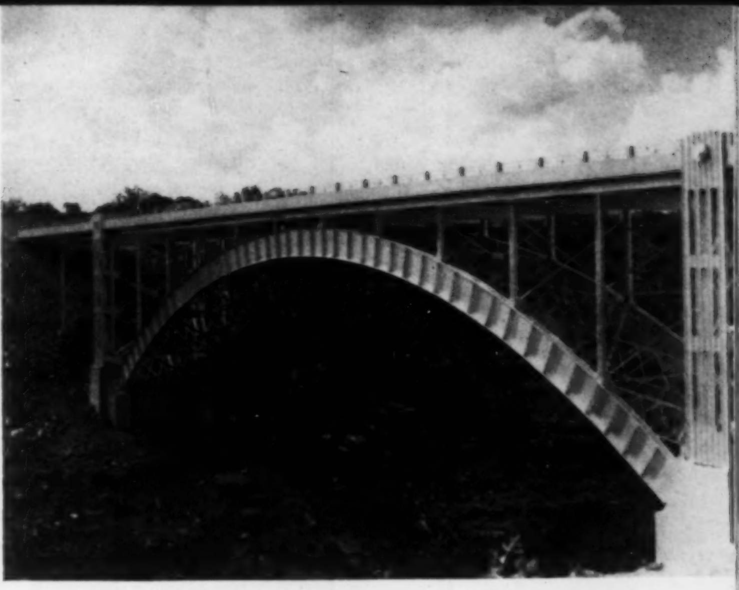
Other factors such as sufficiency of base, sufficiency of surface, accidents, speed and delay, and right-of-way widths may also be included in future studies. This first study, however, is a visual survey and although not a true mathematical analysis, is pointing toward the sufficiency rating which it is hoped can some day be applied to the entire highway system.

An analysis of state highway department records revealed that there were 1,470 miles of obsolete highways out of a total of 2,458 miles on the primary system. Many of the roads built just before World War II were found to be deficient in some respect before they left the design stage, even though in 1938 the department laid down the principle of designing highways based on predetermined safe speeds. Arizona standards contemplated the integration of curvature, spiral runoff, superelevation, horizontal and vertical sight distances and widths in relation to speeds. There were several reasons for these deficiencies: (1) Insufficient funds allocated to individual reconstruction projects; (2) insufficient route location studies beyond the termini of budgeted projects; (3) no definite master plan for reconstruction; and (4) reluctance of officials and the public to accept technical analysis of highway needs.

In other words, administrative planning had not kept pace with traffic demands. Budgeting had been by the shotgun method, whereby a little was scattered over the entire highway system each year. This was done obviously to appease pressure groups, who demanded that counties or districts receive their proportionate division of road funds.

Short projects distributed over the highway system each year might in time be amalgamated into a completed whole, but in the anxiety to build more miles the tendency was to sacrifice the design. This meant that before a route was completed, the first jobs were obsolete. Arizona is too poor to stand much of that. There are also many potential roads in the state that are still waiting for pioneer development. Pioneer routes must take their turn under any scheme, but in a well planned program they have a definite status even though a low priority.

In approaching the problem of setting up a postwar highway pro-



ELEVATIONS RANGING from a few hundred feet above sea level to more than 7,000 ft near Steel Arch, Padre Canyon (right), 25 miles east of Flagstaff, confront rebuilders of U.S. Highway 66. Highway traverses desert valleys, mountains, plateaus and forests, each presenting its own location, design and materials problems.

NEW BRIDGE ON HIGHWAY 66 spans Little Colorado River near Winslow, Ariz. State Highway Department now is spending $1,500,000 per year to reconstruct road as two-lane artery. At this rate, ten years will be required for completion, year short of date when engineers estimate four lanes will be required.

gram, the engineers recognized the need for surveys based on speed-design standards covering entire routes between control points so that construction projects, regardless of location, would all fit into a long-range reconstruction plan.

As an example, U.S. 66, an interstate route across northern Arizona, is 383 miles long. About 51 miles have been rebuilt to a design satisfactory for speeds of 60 to 70 mph. Another 50 miles is susceptible to widening to accommodate a 70-mph American Association of State Highway Officials design. A portion of the latter however, may be temporarily retired because the building of a new road offset to one side would facilitate traffic during construction much better than the building of a detour. The present road would act as a detour and could be rebuilt later to complete the ultimate four-lane divided design. The remaining 282 miles must be retired without salvage.

Most of this necessary retirement is due to obsolete vertical and horizontal curvature, and the entire route, with the exception of the 51 miles recently rebuilt, is obsolete as to width. In 1943 the Highway Commission authorized the first postwar surveys on this route.

Highway 66 is used as an example because practically every problem confronting the highway engineer is found on it. It starts at the Colorado River a few hundred feet above sea level and rises to over 7,000 ft near Flagstaff. It traverses hot desert valleys, rugged mountains, high barren plateaus and snow-covered forest areas, each presenting distinct problems in location, design and materials.

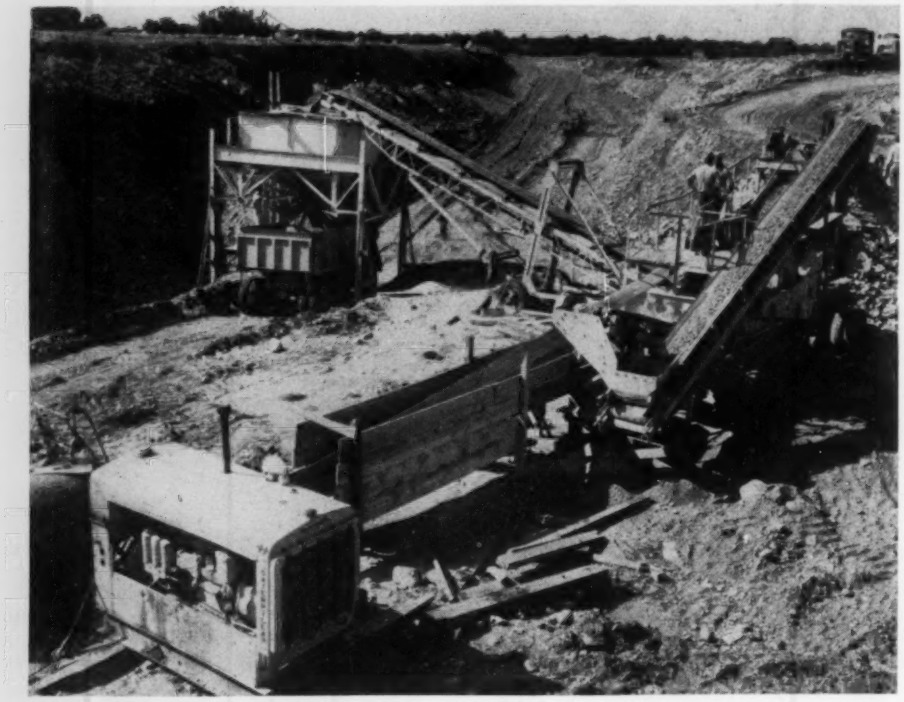
Based on a reconnaissance of the entire route, a design speed of 100 mph was set as a maximum and 70 mph as a minimum for location surveys. Horizontal curvature was limited to 2 deg for the 100-mph, and 4 deg for the 70-mph design. Vertical non-passing sight distance was limited to a minimum of 1,200 ft and 600 ft, respectively.

Preliminary surveys were made. In some cases several stadia lines were projected and the resulting lines and profiles studied for balanced speed design, rise and fall, maximum grades, directness of line, stream crossings and other pertinent features. In practically all cases on Route 66 it was possible to obtain 2-deg maximum curvature and a minimum 800-ft non-passing sight distance, or a minimum design speed of 80 mph.

Highway U.S. 66 has the highest concentration of interstate traffic of any route in Arizona. The 30th peak-hour traffic flow for 1946 was very close to an average of 300 vehicles per hour from Ashfork east to the New Mexico state line near Lupton, a distance of 218 miles. Traffic on this route has now increased 39 percent over 1945 and 28 percent over 1941. If this trend continues, a four-lane design will be needed soon after 1950. However, it is believed that the trend will level off, and may postpone the need for four-lane construction to 1958.

At the present rate of expenditures on U.S. 66—about $1^1/_2$ millions per year—it will take about ten years to reconstruct the present road to a modern two-lane design, which isn't

TRACTOR-DRAWN TAMPING ROLLERS and scraper (background) prepare subgrade for rebuilding part of Arizona's Grand Canyon–Old Trails Highway, Kaibab National Forest. Job includes 82,510 cu yd of roadway excavation and 218,200 cu yd of borrow, 84,000 station-yd overhaul and 377,500 cu-yd-miles special overhaul of borrow.



DIESEL-POWERED ROCK CRUSHING PLANT produces 1,500 tons per 9-hr day. Material produced is used for 19½-mile section of Arizona state highway near Concho. Conveyor belt carries crushed rock to hopper for loading into dump trucks.

far short of the 1958 date set as the time when the two-lane road will probably become inadequate. Present design plans contemplate this trend toward the four-lane divided highway, and in some cases eccentric rights-of-way are being procured to accommodate the future divided roadways.

Surveys are now complete on the entire route from Kingman east, except within town boundaries. Towns along U.S. 66 are all of a like pattern and were laid out by engineers with the old Atlantic & Pacific Railroad, now the Santa Fe, in the 1870's. The streets are narrow, 60 ft between property lines, and parallel with the railroad tracks. Curb-to-curb widths are 40 ft.

During the war each town along this route was included in a proposed "advance engineering" project. In submitting this proposed survey project to the Public Roads Administration under the advance engineering program, maps of each town were prepared that show possible routes for study. The object was to study present and alternate routes through the towns and any future possibilities of routes through or around the towns. The people in the towns saw these maps and immediately concluded they were all to be by-passed.

The result was that all postwar planning by the Highway Department was in disfavor. The "heat" was on, so this phase of our U.S. 66 studies was dropped until a more opportune time. That time seems to have arrived sooner than expected for two of the towns now are asking for relief from the congestion through their communities, due to the unprecedented increase in traffic flow. Although these towns have their rights as individual communities they also must recognize their responsibilities and share those responsibilities with the state in their planning.

Design Emphasizes Adequate Foundation

Arizona highway design today places greater emphasis on the road foundation than was accorded it in the past. A well-drained and stable foundation is of course necessary to preserve the paved surface.

The materials division of the Arizona Highway Department makes a complete materials survey of every project on which a paved surface is contemplated and on most projects that have grading or surfacing of any kind. The materials survey includes the exploration of all proposed roadway excavation and the preparation of the soil profile. On the soil profile provision is shown for the disposition of any undesirable materials encountered, likewise the use of any materials encountered which might be suitable for base or surface aggregates. The materials survey includes the exploration and testing of all sources of borrow, base and surface aggregates and concrete aggregates that can be found within reasonable haul limits.

On completion of the materials survey and the testing connected with it, the materials division submits its report which includes recommended base thicknesses and recommended sources of all borrow and aggregates. These sources are described in the special provisions and are required to be used. Right-of-way is acquired by the Highway Department. Contractors can therefore estimate the cost of these materials much more accurately than if the sources were left to be chosen and acquired by them.

In the materials survey report, cognizance is taken of present and probable future traffic and of climatic conditions prevailing in the part of the state where the project is located. Where soil and climatic conditions are severe, cuts are designed to be excavated to a distance of 8 ft from

STANDARD WIDTHS for Arizona highways are 26, 28, 34 and 40 ft. Center markings on four-lane highway U.S. 60–70 between Globe and Miami are designed to effect center strip for added safety.

the edge of the road, using a roadway ditch 2 ft in depth. This type of section facilitates snow removal and places the cut bank far enough from the roadway so that its chances of supplying moisture to the subgrade are materially reduced. Base courses are always placed over the full width of the road. Most projects built during the last six years have been paved for the full width of the road. Where the concrete pavement is used, the shoulders are paved with a bituminous mix.

Determining the proper thickness of base courses is one of the major problems facing all road-building agencies. No completely satisfactory means of making this determination seems to have been evolved. The materials division believes that the factors of plasticity index and passing-number-200-sieve content probably give more information on the value of a material for road foundation than any other of the known tests comparable in simplicity and cost. Therefore, in the absence of a better method, these two measuring devices to evaluate all subgrade materials are being used, and will be used until some test is found that will be a better evaluating tool. Results have been reasonably satisfactory.

Roadway Widths

Two-lane roadway design widths are based on daily traffic volumes as follows:

Vehicles per Day	Width
Under 50	26 ft
50 to 300	28 ft
300 to 1,000	34 ft
1,000 to 3,000	40 ft

Some variations are made from these design widths on county secondary projects, but in no case has a postwar project less than 24 ft in width been designed.

Arizona has many roads built with various other widths ranging from 24 to 40 ft in increments of 2 ft, but for the sake of standards it has decreased the number of widths to the four given above. The AASHO specifies a multiplicity of widths based on traffic volumes, types of traffic—such as passenger, mixed and trucks—type of terrain, etc. In analyzing these in relation to the needs of Arizona, the four basic widths now in use fall within the AASHO recommendation except that the Highway Department concludes that all traffic-lane widths should be 12 ft.

Highways carrying over 3,000 vehicles per day, or about 350 vehicles per hour for the 30th peak hour, should be carefully analyzed before reconstruction with the aim that all construction will eventually become part of a four-lane design. The Highway Department concludes that an average volume of 500 vehicles per 30th peak hour is an absolute maximum for any two-lane roadway.

Alignment Standards

On the state primary system the standard of 2-deg maximum curvature in open country has been adopted. In rolling terrain a 4-deg curvature has been held, and in precipitous areas 6 deg is a maximum. These limitations give a range of safe-speed design from 60 miles per hour up to 100 miles per hour when using a maximum superelevation of 0.125 ft per ft. In the higher elevations, from 4,500-ft altitude and above, superelevation is dropped to 0.080 ft per ft because of possible ice and snow conditions. Safe-speed design for 2-deg curves is therefore reduced to 90 mph and for 6-deg curves to 55 mph.

The long distances between communities in Arizona are conducive to high speeds. By designing curvature for speeds above the AASHO standard, the day of obsolescence is being delayed while present requirements are met.

All curves from 1 deg and sharper are spiraled and the superelevation is run off within the transition distance. On all location surveys on the primary system, the necessity of obtaining the best alignment that the country affords, both horizontal and vertical, is stressed. With the aid of aerial photography and preliminary surveys, surprisingly better alignment than was first thought possible has been obtained.

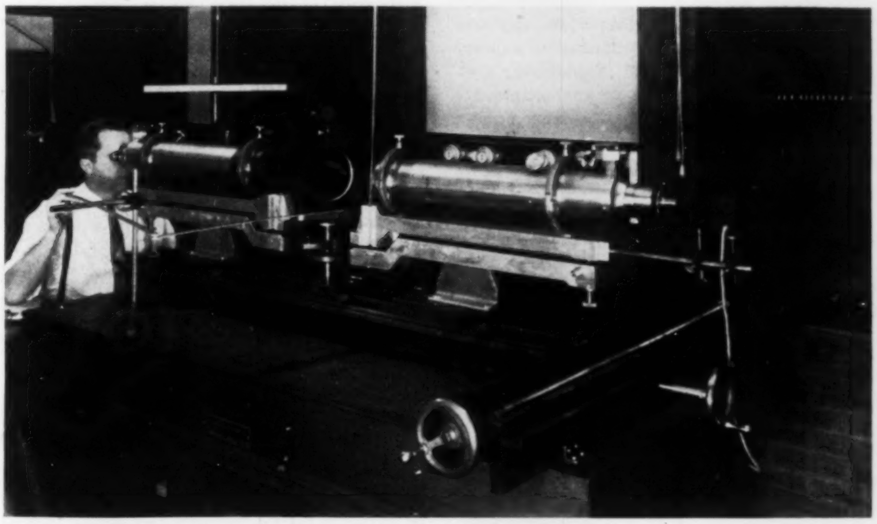
The ruling maximum grade on Arizona Highways is 6 percent, but grades are necessarily kept to a minimum. The problem of vertical sight distance particularly eliminates 6-percent grades in anything but mountainous topography.

An attempt is made to balance the line and grade for sight distances in location work, and in this respect the AASHO standard methods for computing non-passing vertical sight distances based on speed design are followed closely. On locations on the primary system in flat or rolling country, 800 ft is being used as a minimum vertical non-passing sight distance, which gives a design speed of about 80 mph.

Economic Surveys

Between Phoenix and Tucson, the two largest centers of population in Arizona, with estimated populations of 90,000 and 45,000, respectively, a study is being made of traffic requirements in order to consummate a long-range plan of reconstruction. The

(*Continued on page 74*)



PRECISION OF SIGHTING outdoor targets by transits, telescopes and other optical instruments is limited by influence of intervening air column, tests in optical instruments laboratory of National Bureau of Standards indicate. Arrangement of telescope and prism (above) enables research workers to collect data by settings of target outside building. Collimator is added to study effect of magnification for indoor targets. Where atmosphere does not interfere, probable error of single pointing is found to vary with magnification. Little gain in accuracy results from increasing magnification above 20 diameters.

Palestine's Jordan River Valley Plan Emulates TVA Development

ERWIN E. SHALOWITZ
Washington, D.C.

MOST OF THE CURRENT NEWS from the Middle East—Palestine in particular—is political, but there is an engineering story from this historic land that vies with the political news for interest. A plan has been proposed by American engineers for establishing a "Jordan Valley Authority," patterned after our TVA, for developing available power and irrigation resources in Palestine. An important phase of the plan is the proposed diversion of saline waters from the Mediterranean Sea to the Dead Sea to compensate for the Jordan River water used in irrigation.

ONLY IN THE PAST few years has a technological approach been made to power and irrigation problems in Palestine and a plan developed by which the area may better serve its increasing population. In essence, the plan is a Tennessee Valley Authority transferred to the Jordan. The idea was first projected by Dr. Walter Clay Lowdermilk, assistant chief of the Soil Conservation Service of the U.S. Department of Agriculture, in a report on the use of land in the Near East—where he had been sent by the Department, in 1938, in the interest of land conservation in the United States.

In his report, Dr. Lowdermilk stated among other things that he was greatly impressed by the peculiar geography and topography of Palestine, in which he saw the possibility of a great irrigation and power project development. He called the project the Jordan Valley Authority since it was to embody the principles of the Tennessee Valley Authority. He said: "The TVA has set the pattern whereby agriculture, power, and manufacturing can be developed in a coordinated way in the highest interests of the people of a given area and this pattern can be applied to Palestine."

Actually, the idea is a simple one, based upon the principle of preserving the natural resources of the country. Until the advent of the TVA, men built dams upon streams solely to develop power, and the location of one dam had no relation to the location of any other on the same river system. The TVA considered a whole river system as a source of power and prepared to develop it as a whole—not piecemeal.

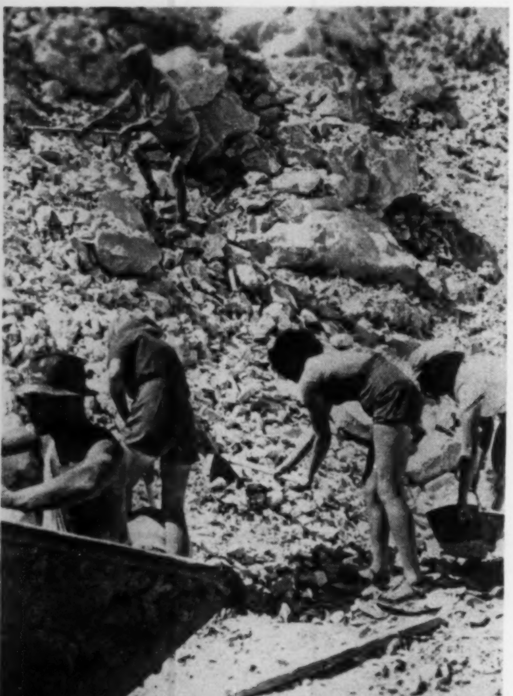
The unique feature of the Jordan Valley Authority plan is the proposal to substitute the saline waters of the Mediterranean for the water lost to the Dead Sea when the sweet waters of the Jordan River are diverted for irrigation.

The plan for the Jordan River system was developed by James B. Hays, former Project Engineer of the TVA, after conducting a thorough study in Palestine of the availability of irrigable land, topography, geologic conditions and water resources. It was unqualifiedly endorsed by John Savage, formerly chief designing engineer of the Bureau of Reclamation and designer of Hoover Dam, Grand Coulee and other large structures, who was sent to Palestine by the U.S. Government for a field examination of the feasibility of the project.

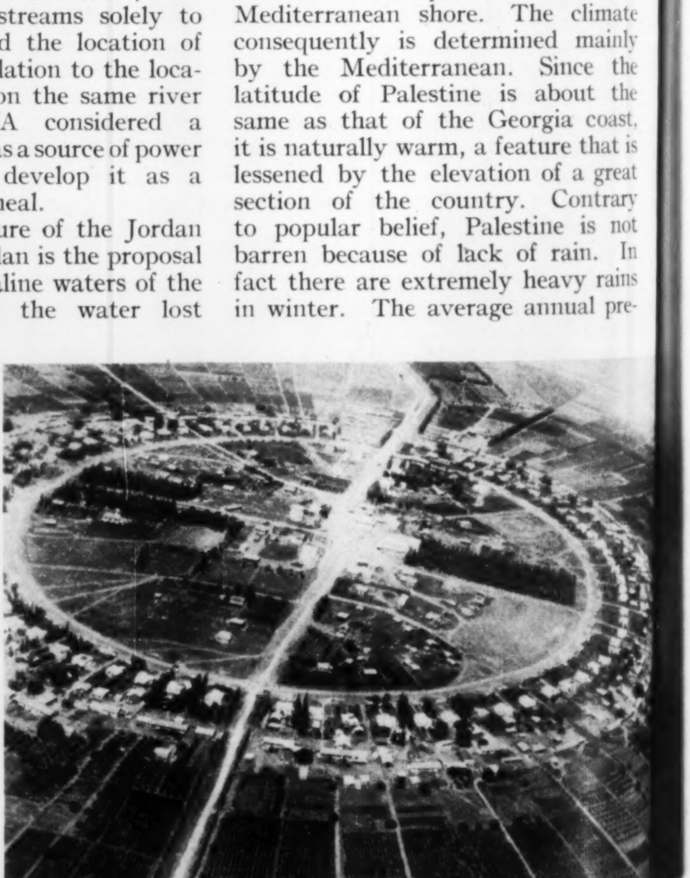
Water Is Primary Need

Water for irrigation to increase Palestine's productive capacity is one of its primary needs today. The centuries of neglect to which Palestine, and for that matter the whole Middle East, has been subjected has denuded its forest, eroded its soil and made barren many of its formerly fertile areas.

Palestine is a small country of approximately 10,500 sq miles, about the size of Maryland. Structurally, it is a part of an ancient plateau that rises in an easterly direction from the Mediterranean shore. The climate consequently is determined mainly by the Mediterranean. Since the latitude of Palestine is about the same as that of the Georgia coast, it is naturally warm, a feature that is lessened by the elevation of a great section of the country. Contrary to popular belief, Palestine is not barren because of lack of rain. In fact there are extremely heavy rains in winter. The average annual pre-



CENTURIES OF NEGLECT have brought major refertilization problems to modern Palestine. Land must be cleared of stones, swamps drained, forests replanted and eroded soil revitalized to accommodate increased population. Irrigation and power development proposed under Jordan Valley Authority would bring water and energy to barren land.



FROM MALARIA-INFESTED SWAMP in 1921, irrigation has converted Nahalal in western part of Valley of Esdraelon into garden spot. Aerial view (right) shows radial plan of colony. Fields, gardens and orchards closely adjoin farmers' homes. School, shops and other community buildings are in center of settlement.

SALINE SOILS along northern shores of Dead Sea (left) are washed to free them of salt and make them suitable for farming. Every inch of soil is flooded with sweet water, then chemically fertilized.

FULL DEVELOPMENT of Palestine's large industry—production of potash (right)—would be stimulated by proposed Jordan Valley Authority. From shores of Dead Sea, lowest point below sea level in world, came bulk of England's wartime potash requirements. Water is pumped from depths of 175 ft, where mineral content is highest, and left to evaporate in hot sun before processing of residue. Dead Sea also yields large quantities of chlorides, magnesium and common salt.

cipitation runs to 22 in., as against only 15 in. in southern California. But most of this rain runs to waste; it quickly percolates through the large expanse of limestone rock so that the surface is wetted only temporarily.

Except for the Dead Sea region, Palestine is an agricultural country. The warm climate and fertile soil would be excellent for this purpose if the soil could be kept irrigated. Surface rivers and well-boring can supply some water, and some progress in this direction has already been made. The tripling of the population of Palestine since the end of the First World War would have been impossible without a proportionate increase in irrigated land.

The backbone of the JVA program is the unique geologic formation of the Jordan Valley. Geologists call it a rift valley, which means a valley in which comparatively large stretches of land have sunk far below the level of the surrounding country as the result of a series of geologic faults. The Jordan Valley rift is only part of a much longer line of weakness. That line begins north of the Sea of Galilee (or Lake Tiberias), runs through the Jordan Valley proper and the Dead Sea and can be followed south through the eastern arm and the main body of the Red Sea into eastern Africa and the great African lakes. However, as a surface feature, it is most pronounced in the Jordan Valley from Lake Tiberias to the Dead Sea. The length of the north-south rift valley between these two bodies of water is about 65 miles. The Jordan River flows in the deepest depression of that rift valley in a bed so winding that the length of the river amounts to almost 200 miles. The Jordan flows into Lake Huleh, which is 230 ft above sea level, and then soon falls below sea level, rushing down through a narrow channel out into a basaltic dam for a fall of 900 ft in the 9 miles between the Huleh and the Sea of Galilee.

Where the river leaves the Sea of Galilee it is 680 ft below the level of the Mediterranean Sea; when it reaches the Dead Sea it is 1,290 ft below sea level. This enormous drop becomes even more impressive if we remember that the depression is separated from the Mediterranean by only a few dozen miles of hill country.

The entire Jordan Valley Irrigation and Hydroelectric Power Development is designed to be con-

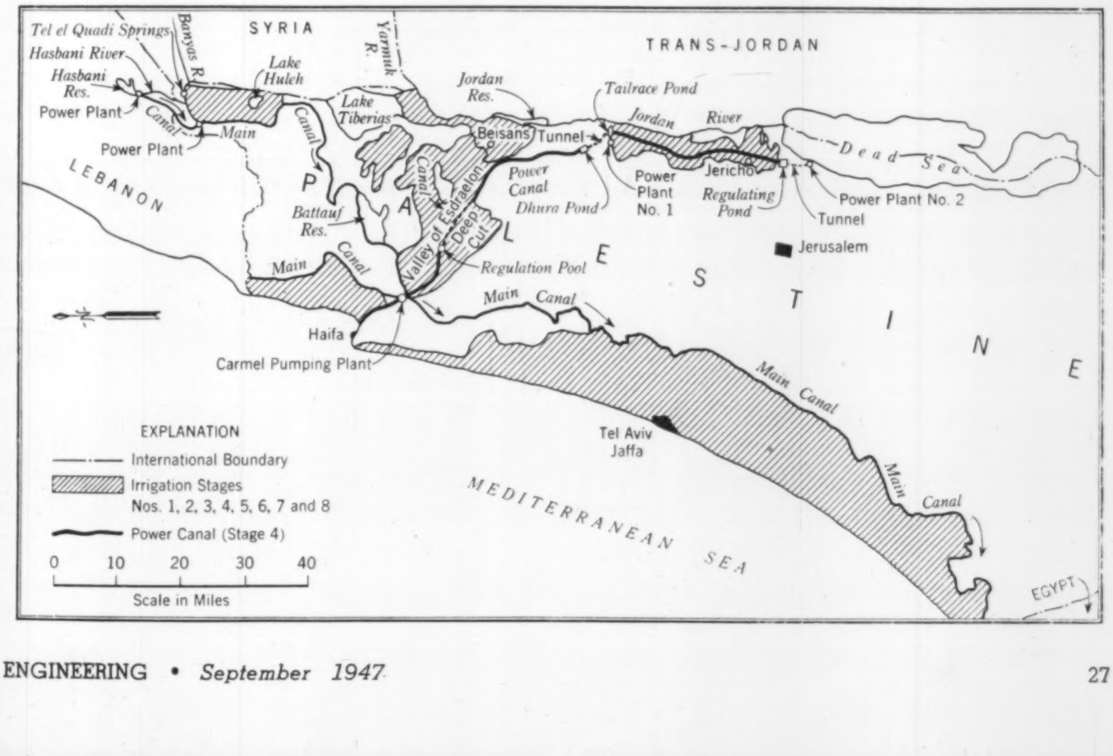
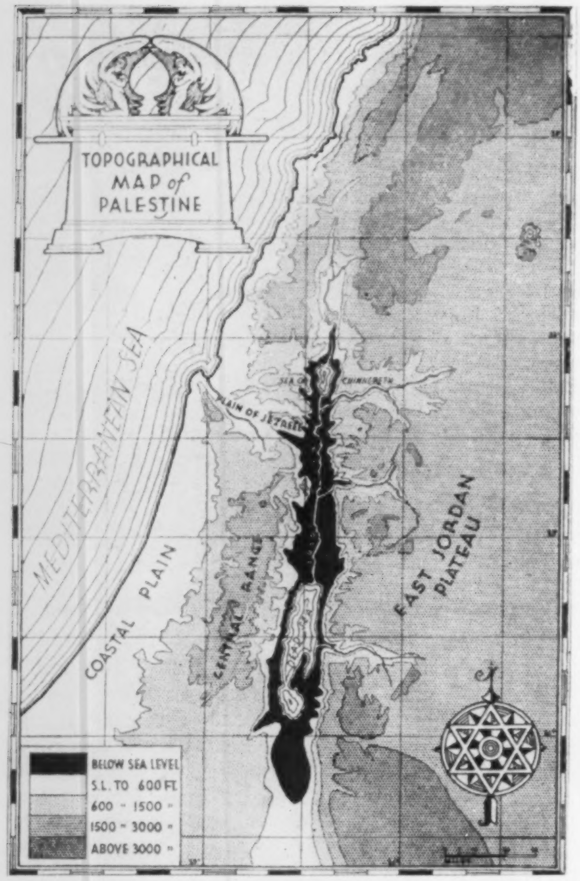

Tel el Quadi Springs
Banyas R.
Hasbani River
Hasbani Res.
Power Plant
Canal
Main
Power Plant
SYRIA
Yarmuk R.
Lake Huleh
Canal
Lake Tiberias
TRANS-JORDAN
Jordan Res.
Tailrace Pond
Beisans
Tunnel
Jordan River
Dead Sea
LEBANON
P A L E S T I N E
Canal
Valley of Esdraelon
Deep Cut
Power Canal
Dhura Pond
Power Plant No. 1
Jericho
Regulating Pond
Power Plant No. 2
Tunnel
Battauf Res.
Main Canal
Regulation Pool
Jerusalem
Main Canal
Haifa
Carmel Pumping Plant
Main Canal
Tel Aviv Jaffa
Main Canal
MEDITERRANEAN SEA
EGYPT
EXPLANATION
International Boundary
Irrigation Stages Nos. 1, 2, 3, 4, 5, 6, 7 and 8
Power Canal (Stage 4)
0 10 20 30 40
Scale in Miles

FIG. 1. IRRIGATION and hydroelectric power development of Palestine is object of proposed Jordan Valley Authority program. Sweet waters of Jordan River and its tributaries would be diverted through network of irrigation canals to unirrigated areas of Palestine, as shown by shaded area. Introduction of sea water from Mediterranean at Haifa to Dead Sea would compensate for diverted waters of Jordan, utilizing 1,300-ft drop between two seas for generating electric power.



PECULIAR GEOLOGIC STRUCTURE of Palestine makes Jordan Valley Authority project feasible. Topography is characterized by four land formations running north to south: Mediterranean coastal plain, Central Range of hills and mountains, Jordan Rift Valley containing Jordan River and Dead Sea, and East Jordan Plateau.

structed in eight stages. Each stage will be complete in itself, but all will ultimately fit together as parts of one large unified scheme. The completion of the entire project would require about ten years.

The program comprises two major aspects, the diversion of the waters of the Jordan River and its tributaries through a network of irrigation canals to the unirrigated parts of Palestine and introduction of Mediterranean Sea water into the Dead Sea (see Fig. 1). At present Palestine has less than 100,000 irrigated acres; on the rest dry farming is practiced. Preliminary estimates show that at least 650,000 additional acres can be irrigated and wide opportunities provided for raising crops of high trade value. This irrigation would be accomplished in Stages 1, 2, 3, 5, 6, 7 and 8 of the JVA Plan. Stage 4 is the Mediterranean power project.

The first stage proposed is the further development of underground water supplies, including sand dunes, by means of wells. Reservoirs would receive the water from the wells and would be interconnected with the main canal system to provide the best overall use of water along the coastal plain.

Stage 2 proposes the recovery of the summer flow from the Banyas River, the Tel el Quadi Springs and the numerous small springs in the Huleh Basin, together with the entire flow of the Hasbani River, for the irrigation of all lands that can be commanded by a gravity-flow canal beginning at the north end of the basin and extending in a southerly direction on the west side of the Jordan Valley, the plains of Esdraelon and other smaller areas.

In connection with this stage and also as a source of power for pumping in Stage 1, the Hasbani plant would be built as soon as possible. The Hasbani Reservoir would store the entire winter flow of the stream with additional capacity for carry-over. This stored water would be released during the summer as needed for irrigation through the canal and power system.

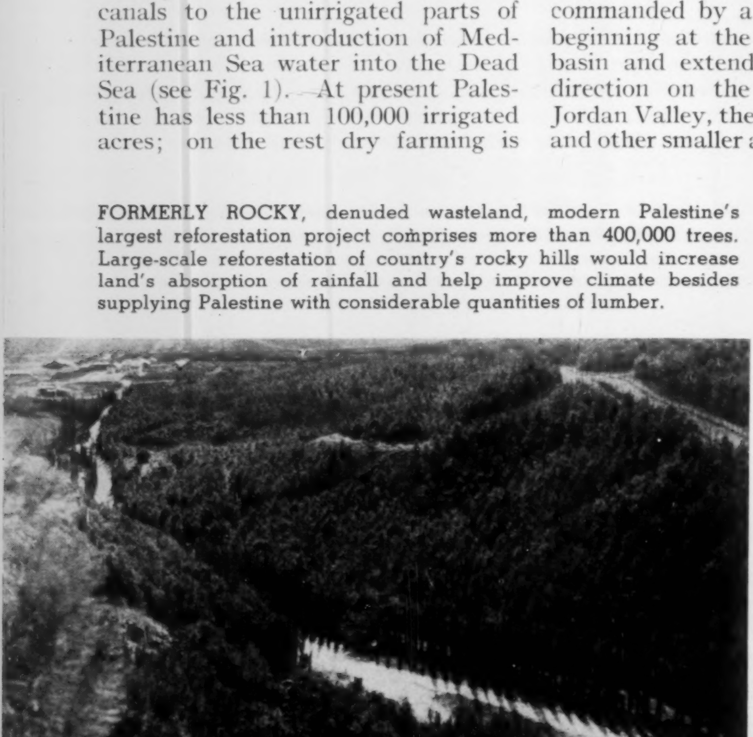
After the waters of the Upper Jordan had been diverted in connection with the Stage 2 development, the level of Lake Tiberias would be lowered. This, together with the normal evaporation in the lake, would cause the water to fall below the lake outlet. In order to prevent this loss, Stage 3 is proposed to divert the waters of the Yarmuk River into Lake Tiberias by constructing a dam at the mouth of the Yarmuk. From the dam practically all flood waters would be conveyed by a concrete-lined canal to Lake Tiberias.

Division of Yarmuk for Irrigation

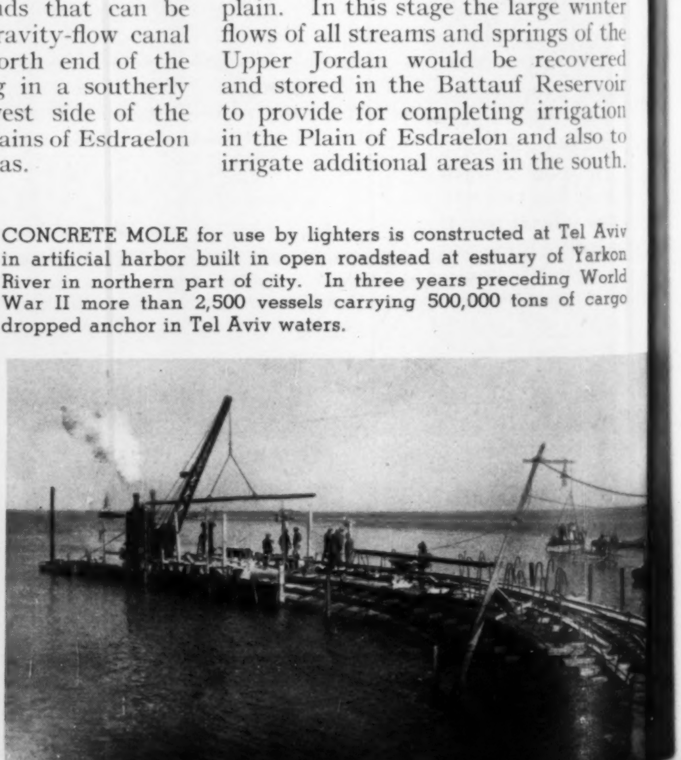
The flow of the Yarmuk, averaging 460,000,000 cu m per year, would be divided equally between Trans-Jordan and Palestine. Out of Palestine's share of the Yarmuk, averaging 230,000,000 cu m a year, about 110,000,000 cu m a year would be consumed by evaporation from the lake; the balance would be used for irrigation along the central Jordan Valley, southward from Lake Tiberias across the Beisan Plain.

Stage 5 includes the construction of a large storage reservoir at Battauf and a continuation of the main irrigation canal to the south coastal plain. In this stage the large winter flows of all streams and springs of the Upper Jordan would be recovered and stored in the Battauf Reservoir to provide for completing irrigation in the Plain of Esdraelon and also to irrigate additional areas in the south.

FORMERLY ROCKY, denuded wasteland, modern Palestine's largest reforestation project comprises more than 400,000 trees. Large-scale reforestation of country's rocky hills would increase land's absorption of rainfall and help improve climate besides supplying Palestine with considerable quantities of lumber.



CONCRETE MOLE for use by lighters is constructed at Tel Aviv in artificial harbor built in open roadstead at estuary of Yarkon River in northern part of city. In three years preceding World War II more than 2,500 vessels carrying 500,000 tons of cargo dropped anchor in Tel Aviv waters.



Stage 6 comprises the reclamation by drainage of the shallow Huleh Lake and Marshes. This development would make possible the irrigation and farming of the rich peat beds in the marshes and the farming of the old lake bed.

Drainage of the area would result in the saving of a large amount of water each year, water which is now being evaporated from the area. These surplus waters, about 44,000,000 cu m a year, would be available for irrigation use elsewhere and would be added to the quantity for use in the Southern Coastal Plain, where about 14,000 acres could be irrigated.

In Stage 7 the remaining Jordan River water would be utilized to irrigate the Jericho Plain area. A part of the water supply for this stage would come from local sources, principally storage of surplus water on streams, and from modernization of the present methods of controlling, handling and distributing available water by means of networks of canals.

Stage 8 involves the recovery and storage of winter flood waters from all of the principal streams draining into the Mediterranean Sea. These waters then would be released for irrigation through the main irrigation canal beginning in the north and ending in the south. The total water available for irrigation has been estimated by the Water Research Bureau as about 320,000,000 cu m a year.

Diversion of Mediterranean for Power

The second part of the program, which is large-scale hydroelectric power development, calls for the transfer of sea water from the Mediterranean into the Dead Sea. This water would compensate for the loss of the waters of the Jordan diverted for irrigation and at the same time would generate electric power. This plan, which involves no irrigation scheme, also would compensate for evaporation loss from the Dead Sea, estimated to be more than 20 ft per year. This amount of evaporation may seem excessive, but it is understandable if one takes into account the high temperatures around the Dead Sea, which exceed 110 deg in the shade.

From the Mediterranean to the Dead Sea there is a 1,300-ft drop with a considerable power potential. A further power potential is found in the rapid descent of the Jordan River from its headwaters some 2,000 ft above sea level. It is estimated that these and other possibilities can be used to produce over 1,000,000,000 kwhr of electric current a year (more than the Norris Dam), a figure that seems doubly large for a country without coal as a natural resource.

CONCRETE IRRIGATION DITCHES run through thousands of acres of orange groves in Palestine. In 20 years citrus industry of country has grown from 1,000,000 cases annually to 15,000,000 in 1939.

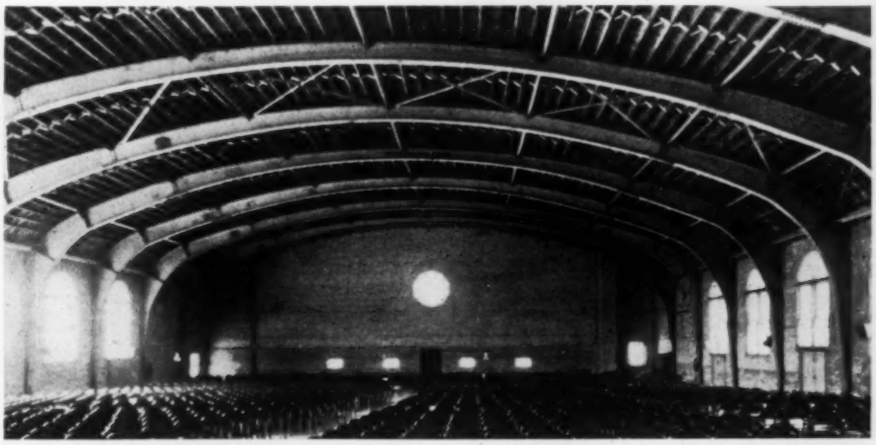
The plan of Stage 4 is as follows:

At the Mediterranean end, a battery of large pumps would lift the water from the intake channel to a canal along the foot of Mount Carmel—starting at about El. 140. A large concrete-lined canal would lead the salt water to a regulation pool in the Valley of Esdraelon. From there the water would flow through a tunnel or deep cut and continue on grade across the Gilboa Hills, across the Wadi Milh and over a divide to the Wadi Dhura, where a large regulation and emergency supply pool would be constructed. The elevation of the surface of this pond would be about 80 ft above sea level.

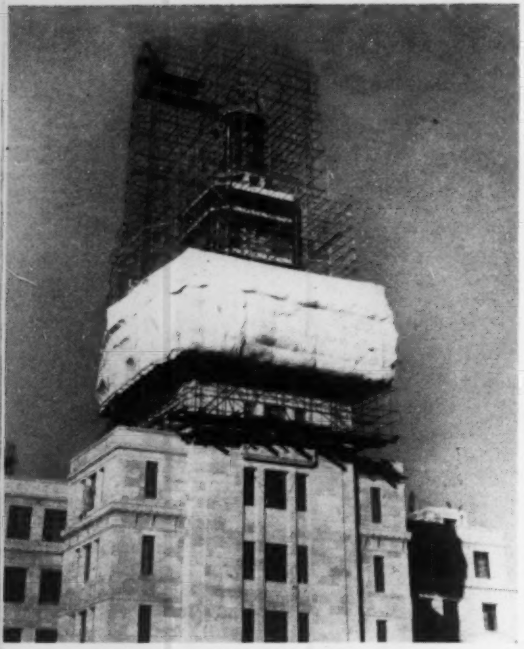
The regulation pool in the Valley of Esdraelon would allow constant regulation of the flow of water from there through the long canal to the Wadi Dhura Reservoir. From the Wadi Dhura pond, a low-pressure tunnel or pipeline would convey the water to a surge tank and to the penstocks that extend down to the proposed power plant on a wadi known as Abu Sidra. The elevation of the tailwater would be about 910 ft below sea level, giving a drop of about 990 ft from the pool to the power plant. From a pool to be constructed at Abu Sidra, a canal running south would convey the water to the final power plant at the Dead

(*Continued on page 74*)

Welded Steel Frame Provides 93-Ft Clear Span



ARC-WELDED FRAME of Chicago church permits clear, unobstructed interior. Structure, 145 ft long, 93 ft wide, with seating capacity of 2,800, has declining floor and invisible heating facilities. Objectionable features of many churches, such as winding stairs, large, swinging fixtures, bad acoustics, poor ventilation and inadequate lighting, are eliminated in this unusual building. Steel frame was fabricated by Midland Structural Steel Co., Cicero, Ill., shipped to site and erected by shielded arc process using equipment furnished by Lincoln Electric Co., Cleveland, Ohio.



METAL SCAFFOLDING used in constructing New England Mutual Life Insurance Co. building, Boston, Mass., eliminates fire menace of wood. Tarpaulins treated to be fire resistive, and properly constructed salamanders, further reduce possibilities of construction fires.

Fire Safety Measures Can Avoid Costly Construction Disasters

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COSTLY DELAYS as well as loss of capital and scarce materials are inevitable results of fires during construction. Uncompleted buildings are especially vulnerable because of drafts, waste materials and lack of fire prevention devices. Unless engineers and contractors enforce rigid safety measures, fire loss is expected to mount as postwar construction gets fully under way. In this article a fire insurance executive tells builders how to reduce risks from common sources of construction fires.

PROVISION OF ADEQUATE safeguards against fire during construction will gain added importance with the increased industrial and commercial building activity expected as materials become more readily available. Likelihood of continued shortages of some materials increases the importance of planning fire preventive measures if jobs are not to be delayed. Studies show that the number of fires in buildings under construction tends to follow construction volume, making preventive measures imperative in an accelerated building program if major losses are to be avoided.

Few persons realize the frequency and seriousness of construction fires. During the five war years of 1941 to 1945 inclusive, 255 such fires were reported in plants insured by the Associated Factory Mutual Fire Insurance Companies—practically a fire each week (see Fig. 1). One fire damaged a large, nearly completed wind tunnel at an airplane plant and another destroyed crated transformers and other scarce electrical equipment stored near a construction office that burned. These fires delayed construction and caused other avoidable losses beyond actual property damage.

A building under construction is more vulnerable to fire than a completed building in use that has automatic sprinkler systems, water supplies, hose, extinguishers and well organized maintenance and fire prevention programs to provide a high degree of security. In unfinished buildings floor and wall openings provide excellent draft conditions. Usually in new construction there is a large amount of readily combustible material to add materially to the spread of fire.

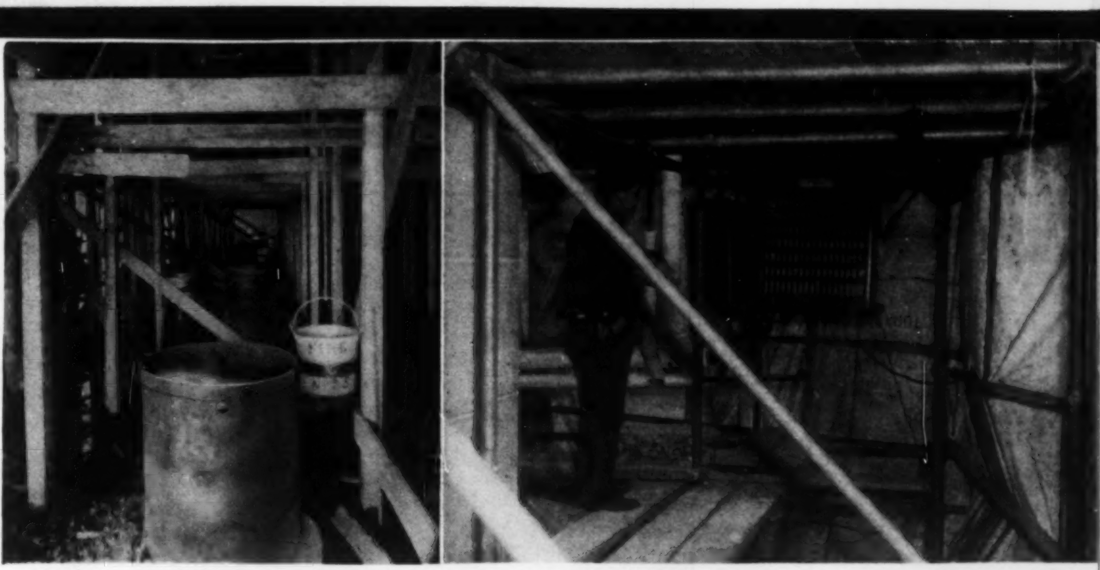
Wood Forms Are Fire Hazard

Some of the more serious fires have occurred in reinforced concrete construction work during freezing weather. The forests of wooden forms and braces provide quick-burning fuel through which fires sweep with such rapidity that even powerful hose streams are not likely to control them promptly. Metal scaffolding largely avoids the serious fire hazard of wooden staging.

The combination of tarpaulins and salamanders employed to prevent concrete from freezing has started many fires. The principal use of salamanders is to dry out plaster or to produce enough heat to permit plastering, brick or tile laying or concreting to continue despite below-freezing temperatures. If the building has not been sufficiently enclosed or if construction includes brick laying or concreting of side walls, large tarpaulins are hung to provide an

HOTEL STATLER

WOODEN FORMS FOR REINFORCED CONCRETE present serious fire hazard. Conflagration (right) started by tarpaulin and salamander combination, used during cold weather, delayed construction of Statler Hotel in Washington, D.C. Acme Photo.



OPEN SALAMANDERS and untreated tarpaulins (left) are second only to cutting and welding as major causes of construction fires. Nearby forms, braces and scrap materials are often ignited by sparks that travel considerable distance from open top. Greater expense of unit steam heaters and steel forms (right) often is justified. Contractors sometimes install temporary boilers or utilize plant boilers for steam supply.

enclosure. They are of heavy cotton duck, frequently made more combustible than the original fabric by some waterproofing method.

The most common form of salamander is a used oil container or steel drum set up on several bricks. Holes are cut in the sides near the bottom to give a draft, and scrap lumber is pitched in at the top. These heating devices sometimes become red hot, producing a serious hazard to nearby woodwork and often overheating flooring or combustible material underneath, even when set on bricks or in a bed of sand.

Flames and sparks may reach considerable distances from the open top, especially when scrap lumber, shavings and waste paper are burned to give a cheap fuel. It is common practice to get rid of waste in this way rather than by hauling it away. Salamanders are often used to provide heat for workmen, and instances are on record where watchmen have used them to keep warm.

Keep Floors Clean

To avoid construction fires from this common source salamanders should be placed firmly on a solid base so that they will not readily overturn, and they should be located well away from nearby woodwork or tarpaulins. Keep the floors clean and free from all combustible material. Do not use empty barrels or steel drums as salamanders.

Fuels used in salamanders have an important bearing on the fire hazard. Coke or charcoal make safer fuels than wood trash or rubbish since they do not burn with a large free flame when replenished and do not throw off showers of sparks. Oil-fired heaters, if well designed and properly located, are even safer, and unit steam heaters are still better if an adequate steam supply can be made available. In some instances construction companies have installed temporary boilers to supply steam unit heaters, and in other cases plant boilers have been utilized. The greater expense may be well justified in important construction work.

Insecurely fastened tarpaulins, loosened and flapping in the wind, may come in contact with salamanders and become ignited. See that tarpaulins are securely fastened. Good practice further dictates the use

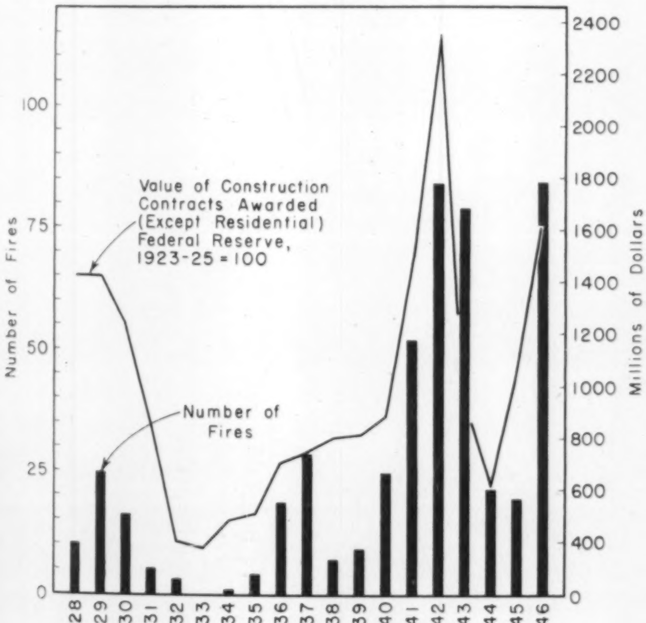


FIG. 1. CONSTRUCTION-FIRE FREQUENCY closely follows construction activity. Chart (above) shows that number of such fires in plants insured by Factory Mutual Fire Insurance Companies usually has paralleled fluctuations in value of construction contracts awarded. Sharp rise in number of fires accompanied heavy wartime construction.

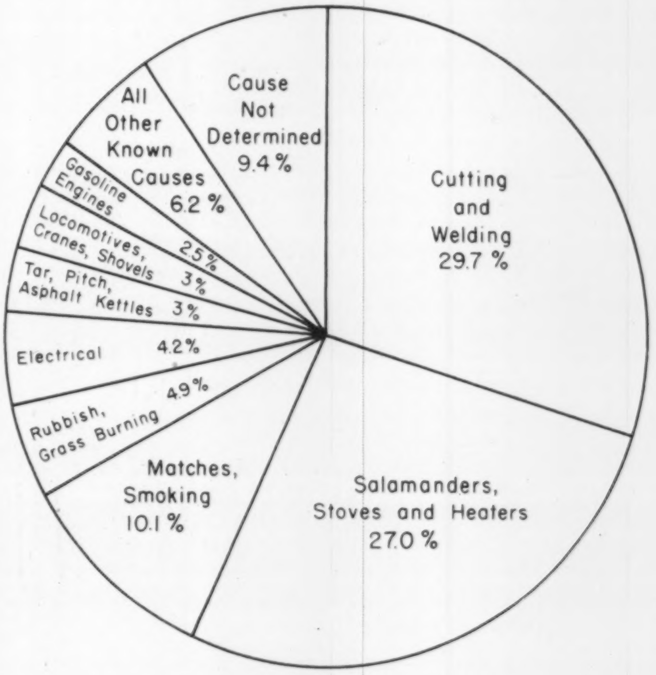
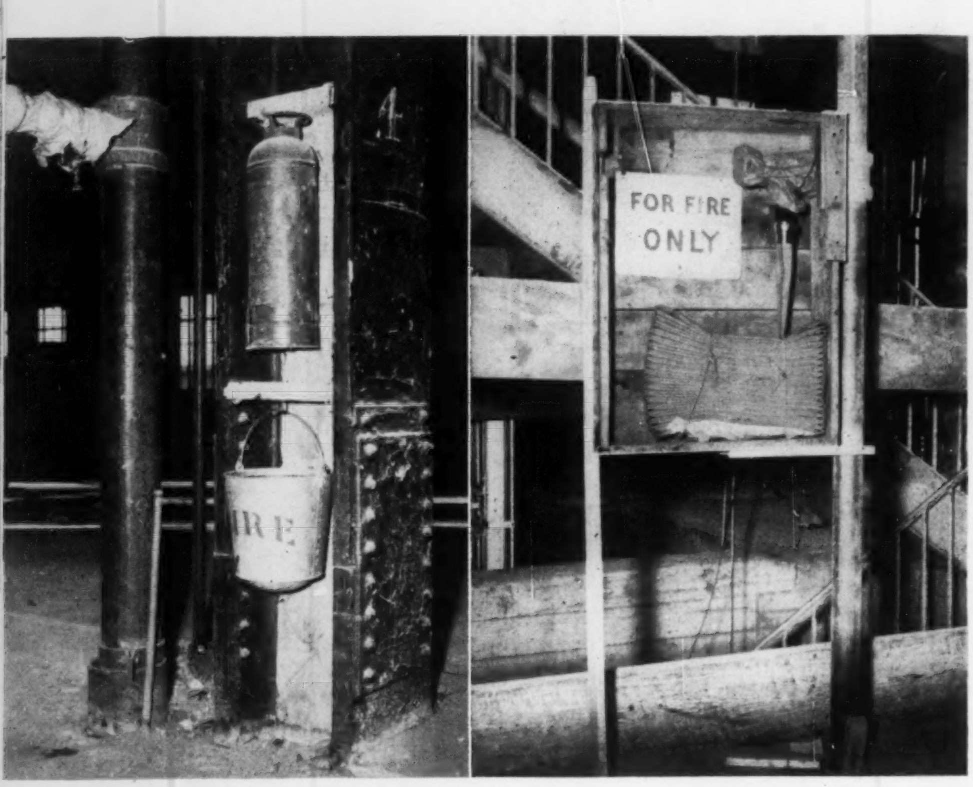


FIG. 2. CUTTING AND WELDING, together with salamanders, stoves and heaters cause more than half of construction fires at Factory Mutual insured plants. Precautions similar to those for use of torches in manufacturing plants should be adopted. In diagram above, causes are shown as percentages of total number of fires.



EXTINGUISHERS AND FIRE PAILS (above, left) provide ready means for quick control of fire in early stage. First few minutes are crucial in dealing with flames. Small hose (above, right), installed during construction, supplements extinguishers and makes greater extinguishing capacity available.

of tarpaulins which have been treated to be fire resistive.

Temporary Structures Offer Risk

Construction offices and shanties present considerable fire risk. The usual light wooden construction burns rapidly, and the greater risk of fire in such structures makes it advisable to locate them so that they will not endanger the building under construction; a separating distance of 50 ft is recommended if practicable. Avoid putting such temporary wooden offices inside the building under construction. Take the usual precautions when installing furnaces or heating stoves; provide ample clearance under stoves and over wooden floors, and cover the floor with sheet metal for a safe distance so that stray live coals or embers cannot ignite the wood. Flues should have ample clearance where they pass through wooden walls.

Some fires have destroyed or damaged valuable equipment or machinery for the new building, delivered before the job was completed and stored temporarily. Frequently such storage is in wooden crates or other combustible containers. A safe location and good fire protection are important for storage of such materials, which might not be readily replaced. The best location, if available, is a nearby building protected by automatic sprinklers. If stored in the yard, the equipment should be kept a safe distance from construction shanties, in a place quickly accessible to hose streams. It is unwise to make such storage in the partly completed building.

Adequate fire protective equipment should be provided from the start. Plans for yard mains, hydrants and automatic sprinkler systems for the completed building should be completed along with the detailed construction plan. Lay yard mains, install hydrants and make connection to water supplies as soon as possible. Provide a good supply of hose and nozzles in advance, and keep them conveniently accessible. Install the automatic sprinklers as soon as the construction permits, and connect them to the water supplies. All of these precautions are desirable if strong fire protection is to be available at the earliest possible moment, with sprinklers in service before the building is occupied or manufacturing starts.

During construction a good supply of extinguishers, water casks and pails, or small hose should be distributed throughout the premises and kept accessible and clearly marked. Workmen then can attack fires promptly on discovery. It is the first few minutes that count.

Quick notification to the public fire department is important. Arrange for one or several fire alarm boxes on or near the premises, and make sure that firemen always will

LIGHT WOODEN CONSTRUCTION makes field offices and shanties subject to rapid spread of fire. Such structures should be located at safe distance from building under construction, or preferably should be equipped with sprinklers.

have ready access to all parts of the building.

Cutting, Welding Are Major Dangers

Many sources of ignition are present as possible fire causes during construction. The Factory Mutual Companies made a study of 404 such fires, largely at industrial properties. The principal cause was molten globules from cutting and welding operations, which started 120 of the fires (see Fig. 2). This danger suggests the need of careful supervision. It is desirable to adopt the same general precautions that prevail when cutting and welding torches are used in manufacturing plants. There a supervisor examines the location where such torches are to be used.

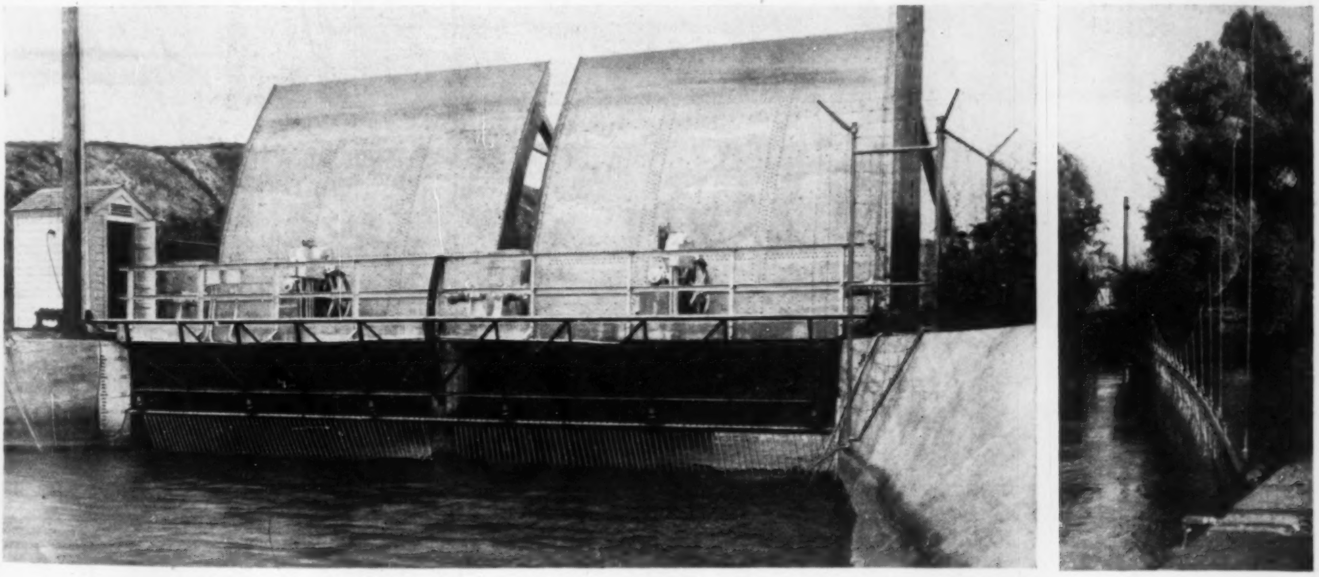
Precautions in cutting and welding are all the more important during construction because automatic sprinkler protection is not available. Combustible material should be moved at least 35 ft away. Screens of asbestos, sheet metal or flameproofed canvas are needed to prevent sparks from flying or rolling beyond the immediate vicinity where the torch is being used. Assign workers to see that molten globules do not lodge in cracks, pass between curtains or fall through openings in floors. Keep small hose, extinguishers and fire pails on hand to put out any incipient fires. After the work is completed, keep a man on the scene to make sure that stray globules have not started smoldering fires. He should check not only the immediate vicinity of the work but also adjoining rooms and the floors below.

The second most frequent fire cause noted in Factory Mutual studies—by salamanders, stoves and heaters—was responsible for 109 of the 404 fires. Next came 41 fires started by careless smoking and use of matches. It is unlikely that smoking on a construction job can be entirely prohibited, but insistance on reasonable precautions appears necessary. Other fires in smaller numbers were caused by overheated tar, pitch and asphalt kettles; by sparks from locomotives, cranes and shovels; by the burning of rubbish and grass; by back-firing or electric defects of gasoline engines and by short circuits in electrical wiring. All these causes suggest their own obvious remedies.

Fundamentally the problem of fire safety is one of supervision. Any good plan can be wrecked by failure of the human element. A capable, intelligent employee should be placed in charge of the entire program. His job is to impress workmen with the hazards and to see that the prescribed precautions are taken. At all times he should have fire prevention in mind and be constantly on the lookout for dangerous conditions or practices.

Charged Screens Prevent Mass Destruction of Fish

NEWLY DEVELOPED ELECTRIC fish screens are now being used to steer millions of fish safely past water intakes of irrigation canals, hydroelectric plants and industrial pumping installations. Similar to "shock sticks" used by cattlemen in close-hauling recalcitrant steers, guardian screens protect fish near dams and canals and fence them within lakes and private fish preserves. The screens consist of one or more rows of electrodes swinging freely in the stream and suspended by suitable overhead supports. An electronic generator developed jointly by Westinghouse Electric Corp. and Henry T. Burkey, of Hollywood, Calif., inventor of device, produces a special wave form of electric current that is effective in charging an area and administering mild and harmless shocks that turn all species of fish away instantly. Debris passes easily through screen.



ELECTRIC FISH SCREEN installation at Platte Valley Public Power and Irrigation District, North Platte, Nebr. (above, left), prevents loss of valuable bass, crappie, blue-gills and other species of fish in hydroelectric plant. Screen is raised in winter months when cake ice forms and fish are not moving. Degree of destruction of unprotected fish in irrigated farm fields, in addition to those lost in power plant intakes, is indicated by nettings in California, where approximately 25,000 salmon were lost in single ditch in 24-hour period. Installation of electric fish screen on large western irrigation diversion (above, right) prevents this mass destruction of salmon.

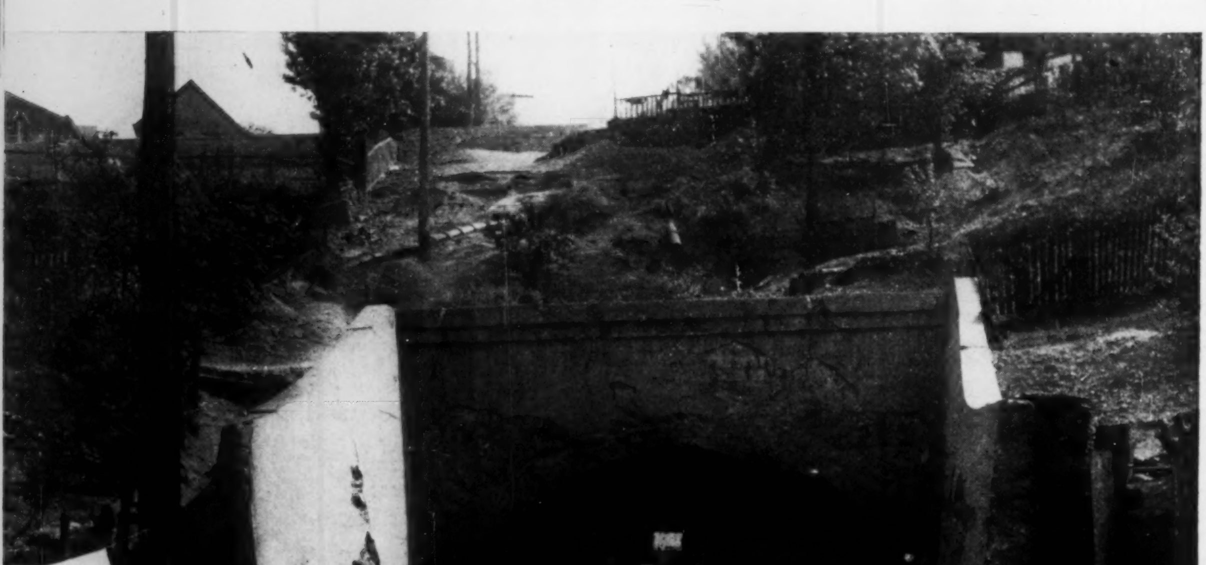
Continuous Lining of Corrugated Steel Waterproofs Reconstructed Tunnel

COL. JOHN F. LABOON, M. ASCE
Consulting Engineer, Pittsburgh, Pa.

A TEST PERIOD of six years since the reconstruction of the Stowe Township Tunnel in Allegheny County, Pa., provides the basis for judging the effectiveness of continuous corrugated sheet metal lining in producing a watertight condition under extremely adverse conditions. Results of the methods introduced on this project indicate that a similar procedure could be used with equal success in new construction.

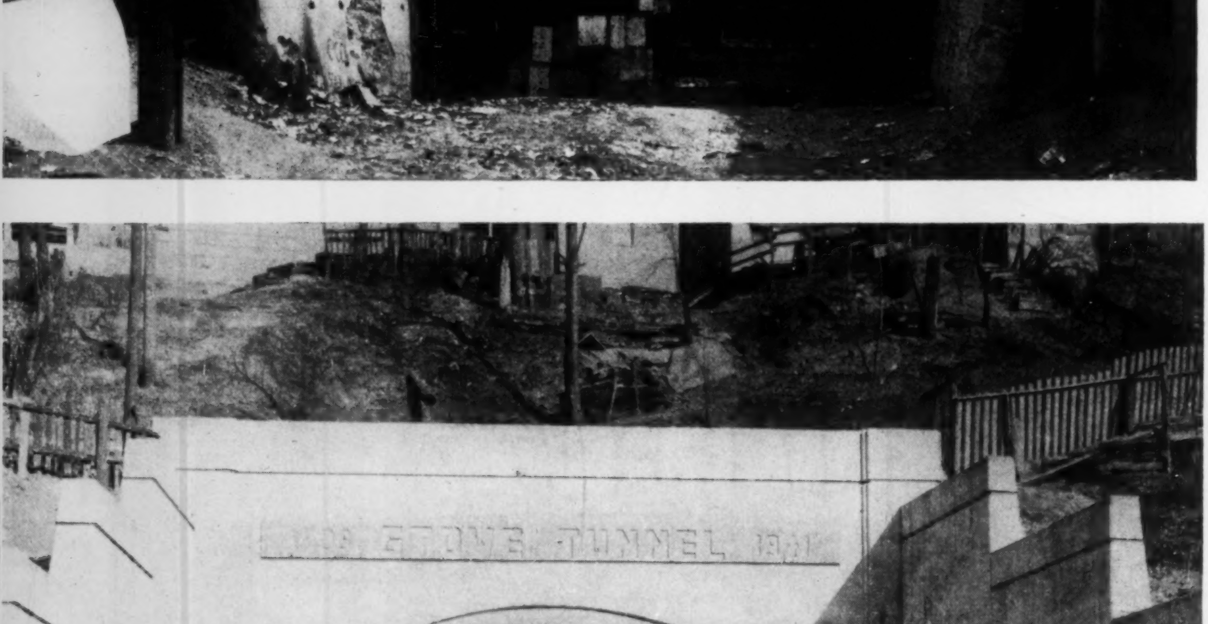
RECONSTRUCTION by Allegheny County of an old highway tunnel built by Stowe Township 31 years before has proved the application of corrugated metal sheets to be a positive means of creating a continuous water seal.

The 492-ft tunnel, an important artery for both McKees Rocks Borough



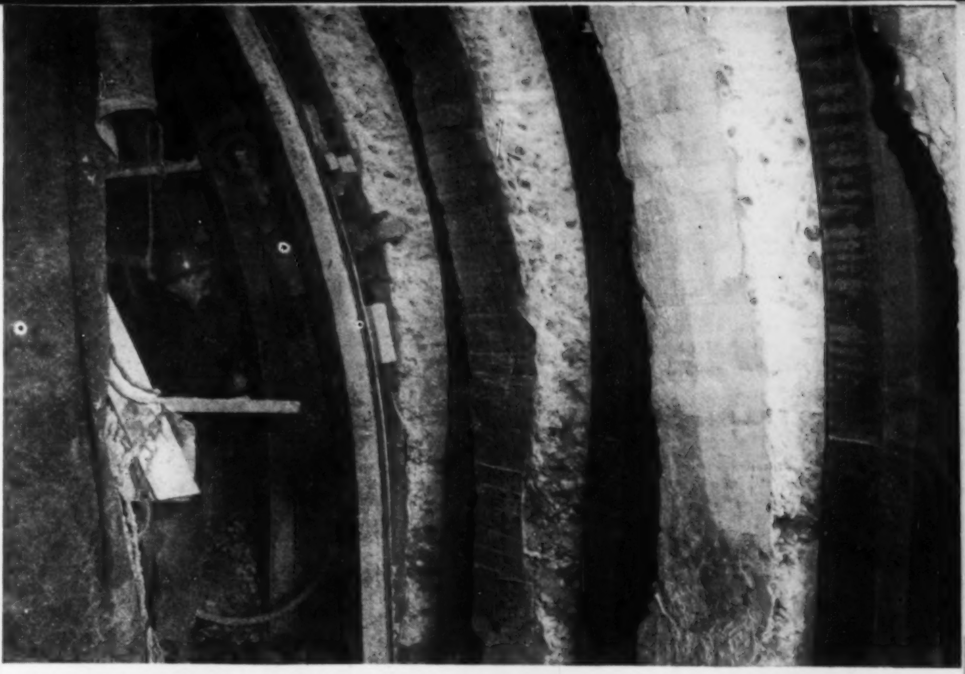
BEFORE

DISINTEGRATING EFFECT of water leaking through concrete lining of 31-year-old highway tunnel in Stowe Township, Allegheny County, Pa., caused partial collapse of roof thus removing tunnel from service as important highway artery for number of years. Inferior quality of concrete in old structure permitted easy removal of sections to allow for insertion of 8-in. H-beam ribs on 4-ft centers throughout length of tunnel as first step in its reconstruction. Redesign work was hampered by lack of plans of existing structure.

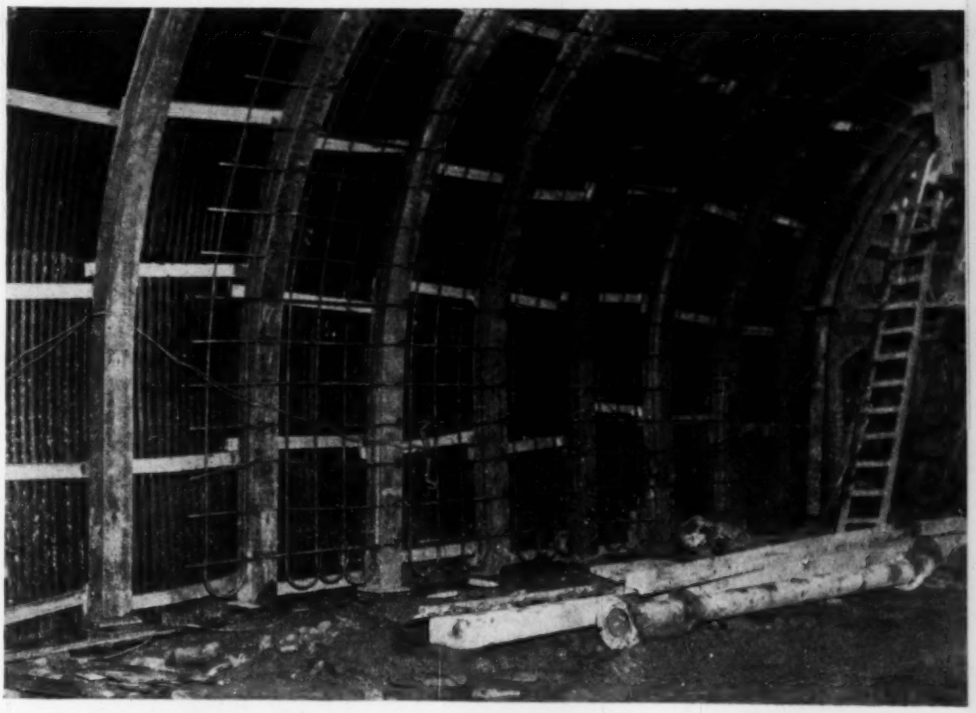


AFTER

REHABILITATED 492-FT TUNNEL has watertight continuous sheet-metal lining installed at total contract price of $152,938, or 80 cents per sq ft. Greater clearances in new structure accommodate heavy highway and pedestrian traffic for McKees Rocks Borough and Stowe Township. Concrete divider strip, 8 in. wide, separates two-way traffic.



TEMPORARY STEEL RIBS support old concrete as it is cut away to permit installation of new permanent ribs. Concrete between permanent ribs is cut away after ribs are placed.



NEW LINING of 20-gage corrugated sheet steel coated with corrosion-proof mastic is held in place by wood wedges behind steel ribs. Lining, properly overlapped for watertightness, has continuous underdrain at bottom. Two-way reinforcing is welded to steel ribs.

and Stowe Township traffic, had been closed down for a number of years because of partial collapse of the concrete lining, principally a result of the disintegrating effects of water seeping through the tunnel roof at numerous points. In 1940 the Commissioners of Allegheny County decided to rebuild the tunnel.

Redesign work was hampered somewhat by the fact that no accurate plans of the existing structure could be found. Inspection indicated that the inferior quality of the concrete lining would permit it to be readily removed where necessary to provide for the new lining and additional clearance for vehicles and pedestrians. However, the advance stage of disintegration of the old concrete made it advisable to provide for cutting it away progressively to allow for installation of 8-in. H-beam ribs, spaced on 4-ft centers throughout the length of the tunnel. Two-way reinforcing steel was placed on the intrados of the steel ribs as shown in an accompanying photograph.

Water Leaks at 32 Points

Thirty-two points in the old tunnel lining were designated as locations of existing water leaks, where corrugated metal sheeting was to carry off the leakage. The new lining of 20-gage sheets of protected corrugated sheet steel coated with corrosion-proof mastic was held in place with wood wedges behind the steel ribs. The sides of the corrugated metal were sealed securely with cement mortar or stiff asphalt plastic cement to keep out the fresh concrete.

The sides of the strips of metal lining were anchored to the existing concrete with 3-in. lag screws and rawl plugs below a point 4 ft from the floor line. Above this point the corrugated metal was wedged into place with wood blocking. These corrugated sheets were placed in one- or two-sheet widths, depending upon the requirements at each of the designated leak locations. The corrugated sheet metal ended in a broken stone drain below the new sidewalks, where a sewer was provided on each side of the tunnel.

The first 125 ft of tunnel lining to be rebuilt was constructed with the sheet metal drains located intermittently as described above, but before the work progressed further it was found that expansion and contraction of the new concrete caused moist spots, the results of leakage, to appear at a few points.

To correct this condition the remainder of the tunnel was constructed with a continuous corrugated sheet-metal lining properly overlapped for watertightness and with a continuous under-drain provided at the bottom of the sheet lining throughout the length of the tunnel. Use of the continuous lining obviated the necessity for bolting the sheets to the wall and calking the sides of the individual sheets as was required in the original design.

The tunnel lining, where the corrugated sheet metal was placed as a continuous water seal, has remained absolutely tight, whereas the section where intermittent metal lining was placed gives indications of less effective watertightness. Twenty-five of the original 32 leaks were effectively waterproofed in the continuous lining section of the concrete tunnel.

As a result of the experience gained in this operation, it is concluded that the same procedure could be applied to new construction, and that a watertight condition can be produced through use of a continuous metal lining regardless of expansion joints or cracks in the concrete lining. The metal sheets are made rustproof with asbestos mastic and consequently will last indefinitely. The metal is light and therefore can be supported with little difficulty even where light steel or wood framing may be needed to keep the sheet metal in place in new construction.

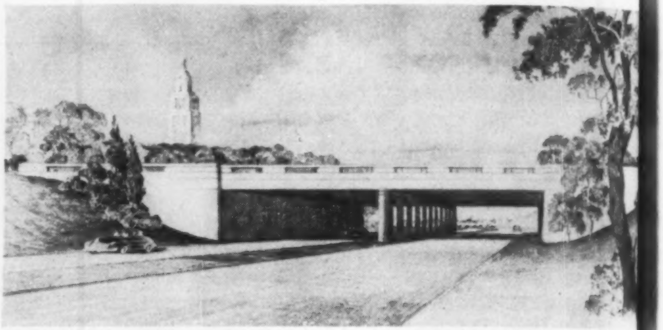
An exhaustive search of literature on construction methods involving many tunnels revealed no positive means of building such tunnels watertight except where metal liner plates were used, as in the case of river tunnels. At the time this work was being done, the writer was director of public works for Allegheny County.

Baton Rouge Plan Calls for Four-Lane Expressway

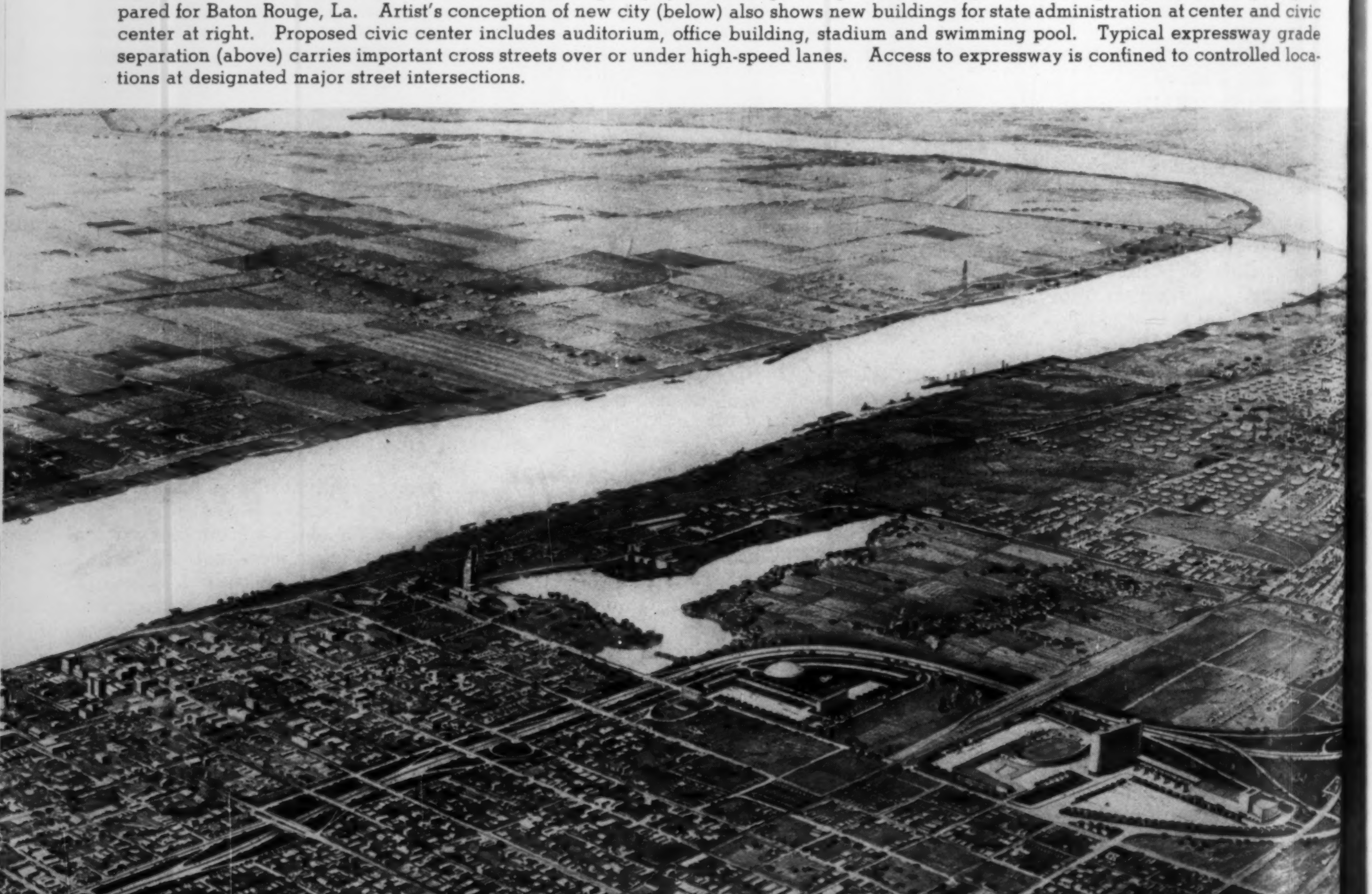
TO ELIMINATE severe traffic congestion now confronting Baton Rouge, La., an overall street and highway plan based on surveys of local and inter-city traffic made by the state highway department and the Public Works Administration has been prepared. A report prepared by H. W. Lochner & Co., Chicago, Ill., is based on a thorough analysis of the capacity and adequacy of the present street and highway system and traffic requirements anticipated for the next 23 years.

The plan seeks to accommodate north-south traffic now too heavy for existing streets and shift intra-city travel to more direct routes. A major item in the proposal is an uninterrupted-flow expressway depressed below the level of adjoining streets. Divided by a landscaped median strip, the proposed four-lane highway has a right-of-way width of approximately 300 ft. Its sharpest horizontal curve of 5 deg permits a safe speed of 50 mph. Each lane measures 12 ft in width with mountable curb and gutter and a 10-ft-wide stabilized shoulder for emergency parking on each side.

Residents of Baton Rouge would realize an economic benefit in 20 years ranging from 138 percent at the center section of the city to 18 percent in the southern part, the planners estimate. Charles Klopp is project manager of the study, and consultants are Harry B. Henderlite, M. ASCE, engineering, and A. Hays Town, architecture.



FOUR-LANE EXPRESSWAY to tie in with interstate highway system is largest single item in comprehensive highway and street plan prepared for Baton Rouge, La. Artist's conception of new city (below) also shows new buildings for state administration at center and civic center at right. Proposed civic center includes auditorium, office building, stadium and swimming pool. Typical expressway grade separation (above) carries important cross streets over or under high-speed lanes. Access to expressway is confined to controlled locations at designated major street intersections.



Stream Pollution Abatement Standards Require Economic Justification

R. B. WILEY, Vice-President ASCE
and
W. E. HOWLAND, Assoc. M. ASCE

School of Civil Engineering and Engineering Mechanics,
Purdue University, Lafayette, Ind.

WISE USE OF our water resources is one of the most promising of all projects for human betterment. Although public health, recreation, esthetic considerations, industry and cultivation of fish life all provide incentives for removal of stream pollution, such action must meet the rigid test of economic justification. Like most engineering operations, pollution abatement programs must pay their own way. Tests for gaging the necessity for stream purification—based generally on the greatest good for the greatest number—are presented herein. Professor R. B. Wiley, co-author of this article, is chairman of the Indiana Stream Pollution Control Board.

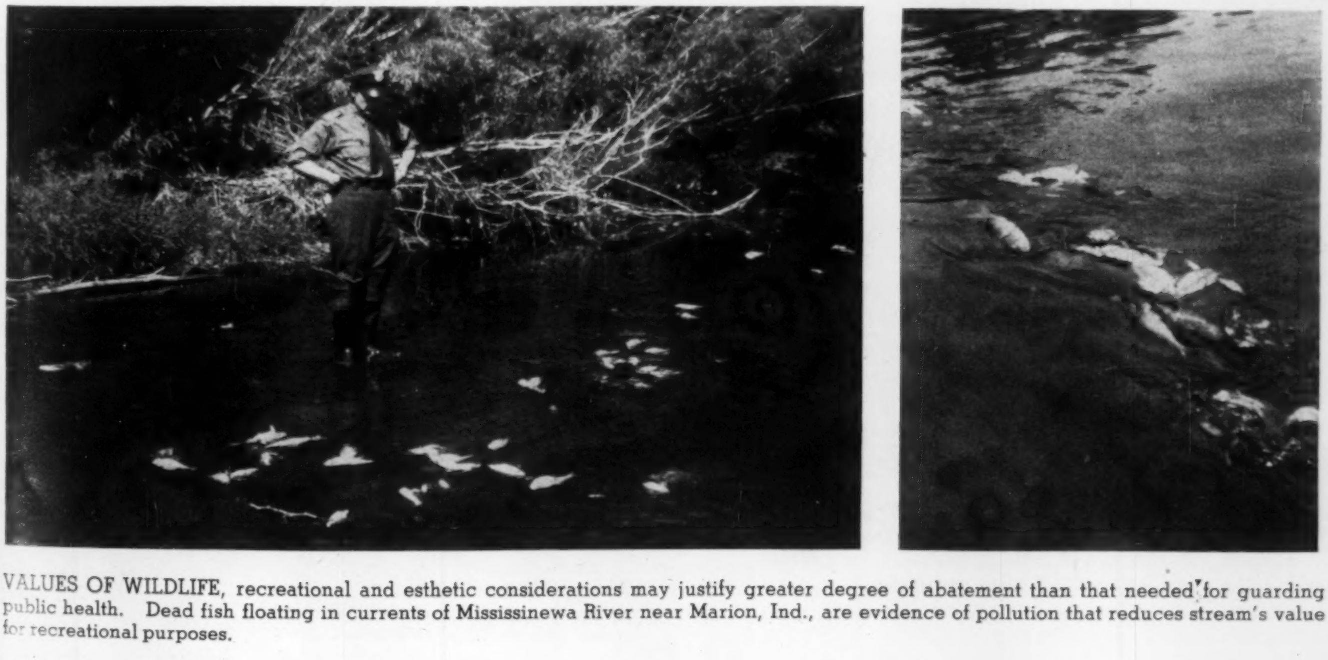
POLLUTION can be defined as an unwarranted or unreasonable amount of objectionable substances contributed to the natural water of a stream which, because of the amount and kind, should be removed, counteracted or prevented from entering the stream.

The important question to be decided is, "What constitutes unreasonable contamination?" and not merely, "What does the letter of the rule or statute precisely require?" For the final test of the action taken must ultimately be that of reasonableness whether the test is made before a court of law or public opinion.

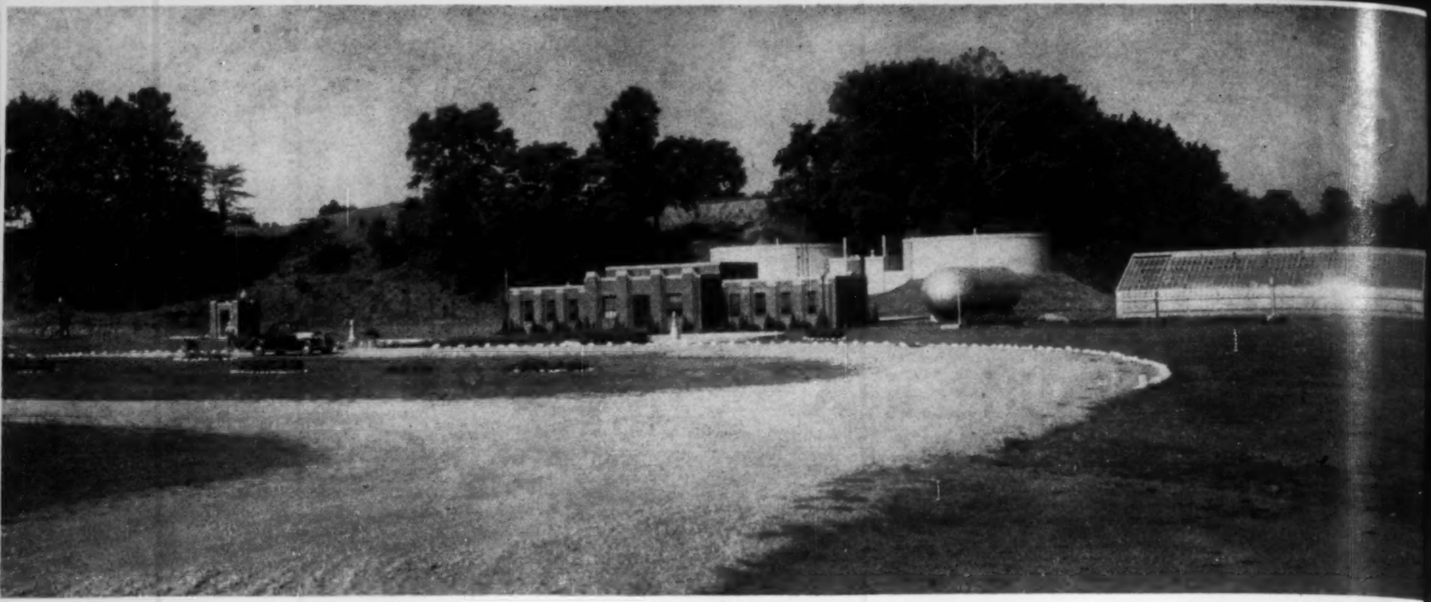
The Indiana Stream Pollution Law of 1943 states that a city or industry can appeal to the circuit or superior court from an order of the Indiana Stream Pollution Control Board. Either party can demand a jury trial. The court then has power "to determine whether said order is reasonable or unreasonable, and whether a polluted condition of any water or waters exists or is about to exist, and to affirm, modify, or wholly set aside such order, it being the intent and purpose of this act that the finding of said Board as to whether a polluted condition of any water or waters exists or is about to exist is final only when so determined by the Court."[1] In every case the board must first be prepared to prove that its order is *reasonable* and, second, that all the provisions of the law have been complied with.

This is strictly in accord with established precedent as stated by Phelps and Montgomery[2] in their masterly summary of the legal aspects of this subject: "And the true rule may be stated to be that each riparian proprietor has the right to have the stream flow through or past his land with its quality unimpaired or its quantity undiminished except in such manner and to such extent as may result from a reasonable use of the stream by riparian proprietors above him."

The general principle for determining unreasonable contamination is the basic principle of all engineering, namely, that of economy in the broad sense of the word. Improvement in the quality of stream water—by elimination or treatment of entering wastes—should be undertaken when those competent to judge feel that the benefits will exceed the costs. Each additional treatment process



VALUES OF WILDLIFE, recreational and esthetic considerations may justify greater degree of abatement than that needed for guarding public health. Dead fish floating in currents of Mississinewa River near Marion, Ind., are evidence of pollution that reduces stream's value for recreational purposes.



WATER TREATMENT PLANTS can be justified on basis of public health, which has definite dollar value. Stream pollution abatement reduces load on water purification plants and increases safety of water so treated. Pictured here is sewage disposal plant at Crawfordsville, Ind.

should cost no more than the benefit that it effects. Thus if primary treatment brings about improvement which is worth more than it costs but additional secondary treatment brings about additional improvement which is of a lesser value than the cost of that additional treatment, then only primary treatment should be undertaken.

If a given project for pollution abatement can pass this basic test of economy, then we believe the courts and an informed public will find that an order of a stream pollution board to abate the pollution is reasonable.

Economy Is Basic Principle

The principle of economy is recognized in one of the preliminary paragraphs of the 1943 regulations adopted by the Indiana Stream Pollution Control Board in the following words: "There is a fair economic balance between cost of treatment of waste and benefits received, beyond which it is not reasonable to expend money for treatment, and the cost of treatment and the benefits to be derived must be considered in determining the extent of corrective treatment to be applied," . . . .[1]

There are some who might object to the consideration of pollution abatement as a matter of economics—fearing that economic justification could not be established for worthwhile projects they wish undertaken. But we are speaking of economics in the broader sense. We believe that the benefits from improvement of streams have demonstrable values exceeding the cost of most undertakings.

Public health itself has a dollar value that can be proved, and public health officials rarely need worry lest the investments in public health they recommend will be outweighed in dollar value to the public by competing uses for these funds. When public health is a significant goal of a given program, then the case for economy is not hard to show.

Stream pollution abatement has many public health values. There is first of all the reduction to practical limits of the load on water purification plants and the increased safety of the water so treated. (A discussion of permissible loads on water purification plants is contained in Bulletins of the U.S. Public Health Service.[3, 4])

Apparently water treatment plants do not wholly eliminate some waterborne diseases. The Committee on Water Pollution of the National Resources Committee wrote in 1939 (p. 35[5]) as follows: "There are some diseases, such as those which swept down the Ohio Valley in 1931, which have not been identified precisely and for which there are no satisfactory means of prevention by water purification. Even in the case of recognized diseases, the danger of epidemics is ever present. There are well defined limits to the degree of bacterial pollution which ordinary water-treatment processes can overcome without danger of epidemics. Negligence on the part of a waterworks operator, sudden or unnoticed breakdowns in the water-treatment plant, and numerous unpredictable events might allow polluted water to enter a distribution system. Recent epidemics in Milwaukee, Minneapolis, Detroit, and other cities show the existence and threat of their recurrence."[5]

Another important consideration is the danger of spreading of disease by:

(*a*) Swimming and wading.

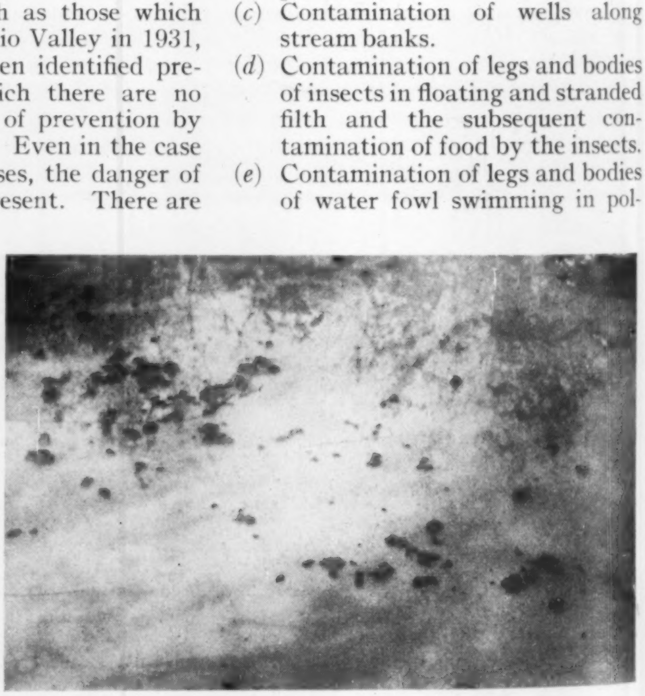
(*b*) Cattle wading in streams, the contamination of their udders and the subsequent direct contamination of milk in the milking pail.

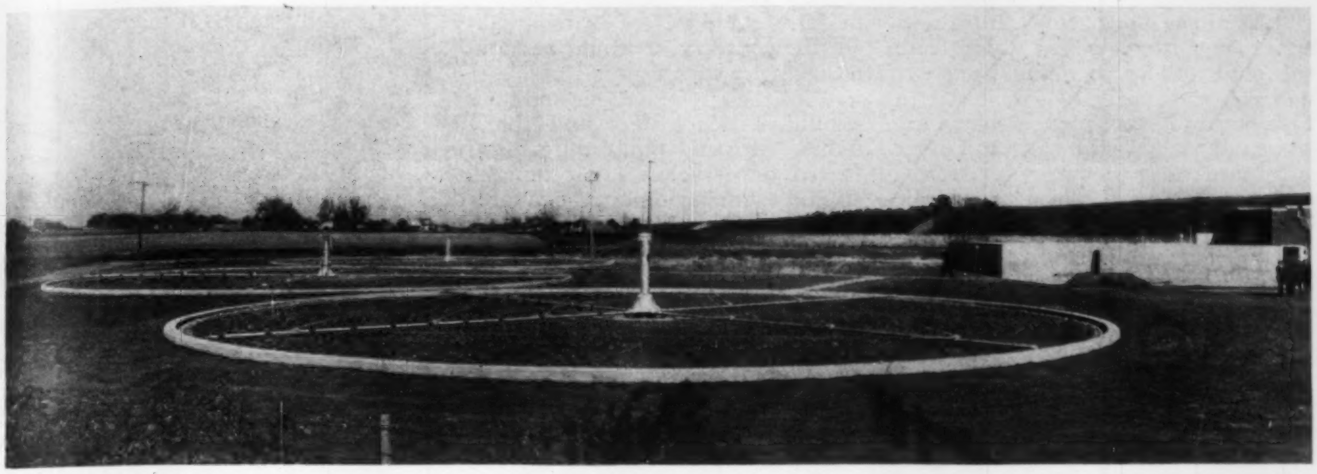
(*c*) Contamination of wells along stream banks.

(*d*) Contamination of legs and bodies of insects in floating and stranded filth and the subsequent contamination of food by the insects.

(*e*) Contamination of legs and bodies of water fowl swimming in pol-

FOR RECREATIONAL PURPOSES in state parks, or in other areas that may be so developed, it may be feasible to eliminate completely all visible evidences of stream pollution. With health hazards removed such streams could be widely used for fishing, picnicking, boating and swimming.





AMOUNT OF TREATMENT should be governed by benefits effected thereby. If cost of secondary treatment cannot be economically justified only primary treatment should be undertaken. Pictured here are trickling filters at Lebanon, Ind., sewage treatment plant.

luted water and subsequent contamination of drinking water in storage reservoirs.

(*f*) Contamination of fish, especially shellfish.

Thus there are many important values in public health that come from stream pollution abatement that can be shown to have economic value. Furthermore, these matters seem to be important to the lay public as shown by letters received by the writers from aroused public-spirited citizens.

If a pollution abatement project cannot be shown to be economic in this broad sense, then it probably cannot be sold to the public—certainly not by the kind of straightforward, honest engineers needed to carry it through. Merely to argue that it is the style or the fad or the thing to do is not the best way to sell waste treatment, however effective this method may prove in selling crazy hats to women or liquor to "men of distinction." Nor is it a valid argument that we can get good old Uncle Sam to supply the money.

Programs Often Unnecessary

There may be situations where the proposed sewage or waste treatment program should not be undertaken without careful balancing of all advantages and disadvantages. Here are several instances:

1. Where the public health is only remotely involved and where the money needed to build the project probably would be taken from funds needed for schools and school teachers.
2. Where the quality of the stream water would be only slightly improved by the proposed project.
3. Where the removal of the waste would result in the removal of an industry judged to be vital to the prosperity of the community.

The simple principles of economics probably would operate satisfactorily and almost automatically in a well-informed community if those who would benefit from the improvement were precisely those who must pay the costs. Since this identity of interest rarely occurs, regulating bodies are needed to fix responsibilities and determine policies. Phelps and Montgomery have shown that:

"To protect its streams against pollution, a state may, without providing compensation, curtail the rights of the riparian owner in his use of the stream, according to the weight of authority." (p. 89[2])

"A state may leave to a commission or board the details and legislation for protection of its waters." (p. 114[2])

Mr. Robert Hallowell, Jr., when Deputy Attorney General of Indiana,[6] wrote with reference to stream control: "It [the law] seeks the greatest benefit to the greatest number under the circumstances existing at the time and place. . . . " He then went on to show how the old principles of the law relating to pollution, though retained, often result in contradictory applications as the needs of the people and the arts of sewage treatment evolve.

The principle proposed for determining when pollution abatement should be undertaken—which may be stated as "minimum net cost" or "maximum net benefit"—is sufficiently flexible to cover all situations but perhaps not sufficiently definite to serve as a practical guide. To use this principle, more extensive calculations of intangible benefits, etc., are required than could be devoted to each special case. Hence rules of thumb are adopted in terms of minimum stream standards that have been judged to represent the ideal of maximum benefit to society as a whole. But it must be realized that these standards are but ways and means to a more important end, the greatest good to all concerned.

There are instances of an industry's making a product of great value that unavoidably sends into the stream a waste product seriously impairing the quality of the stream water. The wartime synthetic rubber plants produced such wastes. Few reasonable persons would have objected to this use of the streams when the success of the war effort seemed to depend upon the product so made. In other words, the benefits exceeded the costs and society was willing to pay the price, stream standards to the contrary notwithstanding.

At the same time we can anticipate a time when the art of sewage and industrial waste treatment will be so perfected that it will be entirely feasible and economical by treatment of the wastes that enter a stream to restore it in effect to its original natural clarity and purity.

Standards Must Be Flexible

For these and other reasons to be mentioned later, we consider that the so-called stream standards must be flexible and considered tentative. They are to be guides to the judgment, not binding restraints upon officials or others who bear responsibility for wise administration of the water resources of the state.

The report of the National Advisory Committee on Water Pollution, already referred to herein, states as follows:

"Three factors make it wholly impracticable to establish standards of water quality on a national scale.

"Stream systems are Nature's sewers. They carry excess water from the land and in so doing transport mineral and vegetable wastes. In their natural state some streams are so heavily laden with salts and other substances that they are unpalatable and support only a meager aquatic life. Others naturally have a high silt content. No stream has pure water in a strict sense; pure water is found only in the laboratory. Water as man finds it in nature is H_2O plus other chemical elements or compounds and a population of microorganisms. It varies from one drainage area to another in hardness, iron content, calcium content, color, suspensoids, and in several score of other respects. The elimination of all pollution would not return the country's water bodies to a uniformly 'pure' state, but rather to a natural state which in some areas would be fully as objectionable from a human standpoint as the present polluted state.

"Stream systems change greatly in volume from time to time, so that flows which in some months or years are adequate to dilute all natural and man-made wastes, may be wholly inadequate at other times.

"Human use of water and adjacent land varies as much within drainage basins and from one basin to another as do the quality and quantity of water. The predominant demand for water in one area may be for domestic use, and in another for industrial use, and in still another for fish production.

"For these reasons—the differences in natural water quality, the variations in stream flow, and the differences in human requirements—abatement of water pollution in the United States could not be advanced appreciably by setting up rigid or uniform standards of water quality. On the contrary, it would be greatly retarded by such a procedure."

With these reservations and understandings the writers and the Indiana Stream Pollution Control Board nevertheless favor minimum stream standards for the State of Indiana. For standards of stream water quality are like the legal axle-load limits placed upon trucks that travel over the highways. The ultimate goal is economy. No one wants to prevent a given trucking company from enjoying the benefit of the highways, but a single heavily overloaded truck may do more damage to the road than it possibly could save the owner in decreased transportation costs. Similarly a single polluter of a stream can do much more damage than he possibly could save in avoiding the expense of the waste treatment. Legal limits are required in both cases and for similar reasons: to avoid over-all waste and loss to the community as a whole.

Higher Standards Proposed

It would therefore appear that a given set of stream standards adopted for the state as a whole must be considered as minimum standards—that efforts should be made to attain higher standards for many streams to meet the demands of economy. What may be the particular and appropriately higher standards that should apply in particular instances? These will be discussed with reference to the various uses to which the stream may be put.

1. General Recreational Uses. Certain streams, particularly those now largely unpolluted, or others that it is feasible to make so, may well be devoted to intensive use for recreational purposes in state parks or areas that can be acquired as such.

In such streams it may be feasible to eliminate completely all visible evidence of pollution and to make them entirely safe even for bathing. No unnatural floating matter or recognizable artificial suspended matter should be tolerated and all hygienic standards of water quality should be made very high. Certain other streams now relatively clear and unsilted also should be restored and protected against visible evidences of pollution or health hazards for the enjoyment of fishermen, picnickers, canoers and even occasional swimmers.

Recreational Uses Defended

Many persons find muddy streams unattractive however unpolluted they may be. They would like to see new methods of agriculture that would not muddy the streams or, pending this reform, would prefer that the clearer waters be relieved of pollution.

The Wabash Valley Association Report contains the following statement:

"There is a problem of living in the Wabash Valley which no one but a native should dare to mention. It is the difficulty of finding an attractive natural spot within a reasonable distance of home for a picnic, or where the family may go wading or bathing—a place where there are trees and meadows and a clear running brook, or lake, or river. One knows that the song 'On the Banks of the Wabash' must have been written long ago when the cornfield and the pasture and the pigpen did not crowd the very underbrush off the banks and spill earth and manure into the water itself, or when sewage in the river from cities was not in evidence. . . . A visit (of over 70 blistering miles) to the nearest state park does but prove that Hoosierland can be as fair a place as when the poets praised her."[8]

The advisory committee on water pollution of the National Resources Committee concluded regarding the recreational use of water:

"The committee wishes to emphasize the importance and the intangible character of the wildlife and recreational effects of water pollution in comparison with its other effects. As the public health hazards are eliminated or minimized, and as that abatement which patently is feasible from the standpoint of reducing water treatment and corrosion costs is accomplished, the justification for a greater degree of abatement will rest in considerable measure upon the values assigned to wildlife, recreation, and the esthetics of clean

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[1] **Stream Pollution Control in Indiana, *Journal American Water Works Association,* Vol. 88, September 1946, p. 1043.**

[2] **Stream Pollution "A Digest of Judicial Decisions . . . . ," Public Health Bulletin No. 87. Treasury Department, November 1917, Government Printing Office.**

[3] **Experimental Studies of Water Purification, Public Health Reports 1926–1927, No. 41, p. 2121, No. 42, p. 1841, Washington, D.C., Government Printing Office.**

[4] **Studies of the Efficiency of Water Purification Process, Public Health Bulletin No. 172, Washington, D.C., Government Printing Office.**

[5] **Water Pollution in the United States (1939), House Document 155, 7th Congress, 1st Session, Washington, D.C., Government Printing Office.**

[6] **"Historical Legal Background of Stream Pollution Control in Indiana," Robert Hollowell, Jr., *Proceedings First Industrial Waste Utilization Conference,* Purdue University.**

[7] **"Stream Pollution in New York State," H. B. Ward, State of New York Conservation Commission, Albany, 1918, p. 47.**

[8] **Report of Technical Committee, Wabash Valley Association, Engineering Bulletin, Purdue University, May 1944, p. 171.**

streams. Public health always will be the basic consideration in pollution abatement, but the relative importance of wildlife, recreational, and general esthetic considerations seems likely to increase."[5]

2. **Uses as a Source of Industrial Water Supply.** It is entirely possible that the industries along a particular stream would greatly benefit from adoption of a particular set of stream standards peculiarly appropriate to their needs—standards that are materially higher as to pH, incrustants, etc., than the adopted standard for the state as a whole.

3. **Uses for the Cultivation of Fish.** Many streams, although probably not all, could well be made suitable for fish life. Exacting standards are required. A moderate amount of sewage is not necessarily harmful to fish life; in fact, as pointed out in a paper by Professor Ricker,[7] sewage may, theoretically at least, increase the growth of the fish. When a given stream is to be made suitable as a habitat for fish more specific standards to encourage fish life must be adopted.

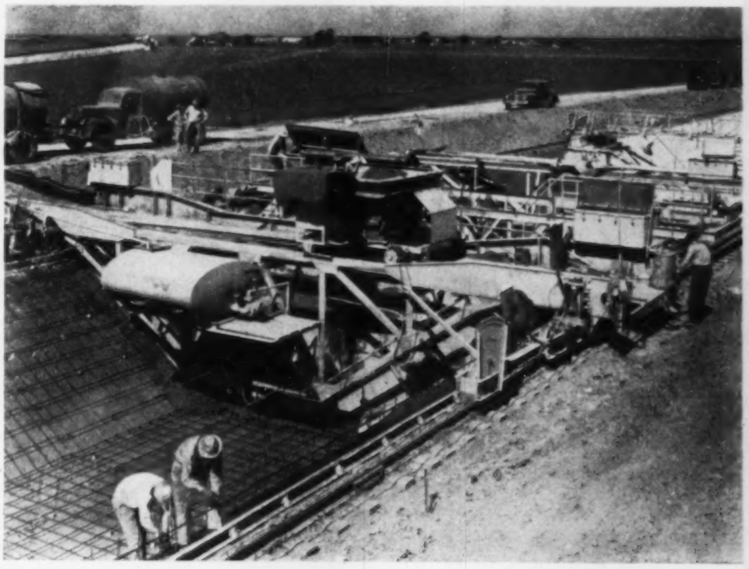
The abatement of stream pollution is but one phase of the administration of our water resources. As stated in the Wabash Valley Association report:

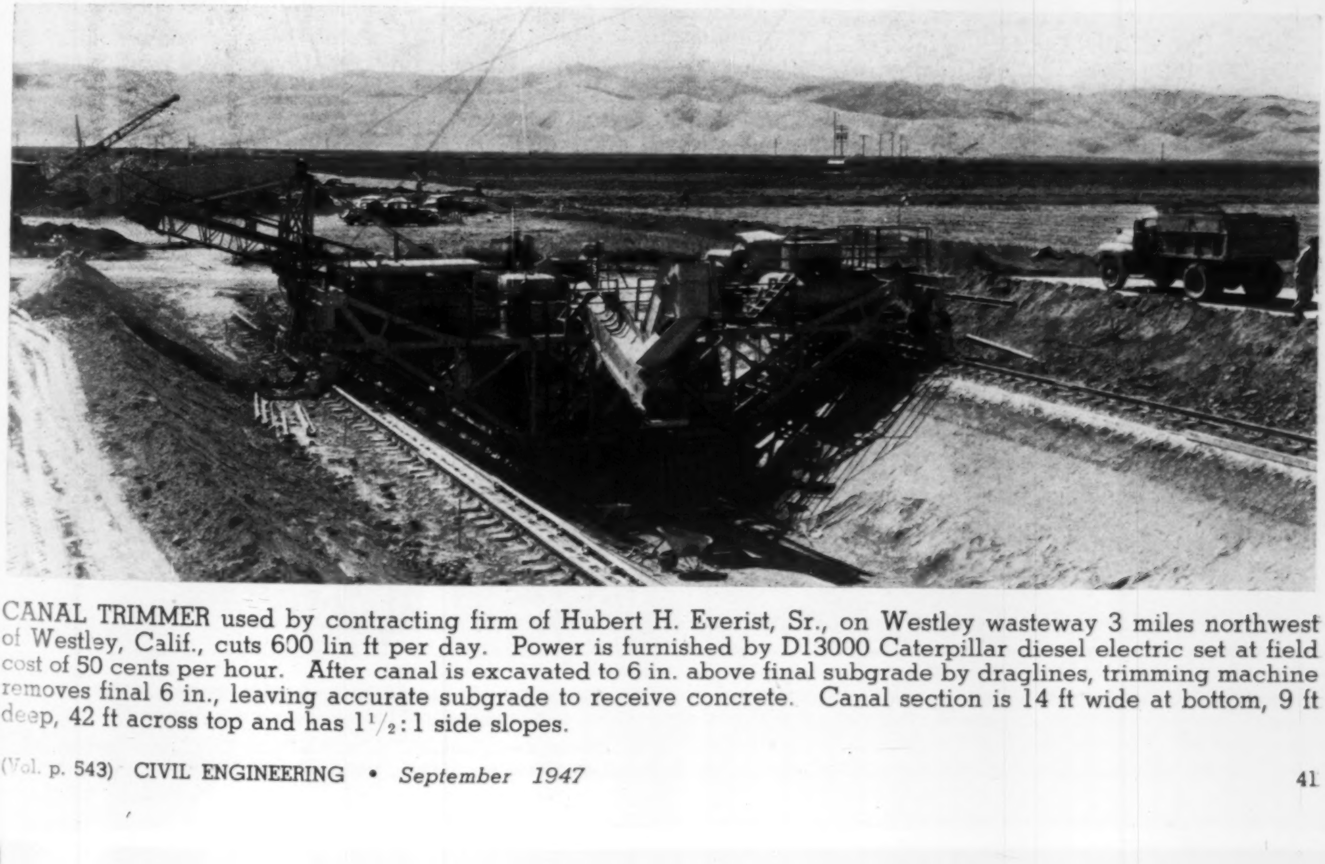
"Of all the many projects that have been conceived to promote the general welfare, there appears to be none

(*Continued on page 76*)

Slip Form Places Wasteway Canal Concrete

SPECIALLY DESIGNED canal paving equipment places concrete lining of Westley wasteway canal, irrigation structure extending from Delta Mendota Canal to San Joaquin River in California. Concrete for 6-in. reinforced slab is mixed by 24-E dual paver, which delivers it to distributor car on top of slip form. Clamshell-type gates controlled by operator on car facilitate uniform distribution of concrete over full width of canal. Divider plates in slip form's receiving hopper restrict flow of concrete down slopes. Vibrating element within hopper produces constant vibration through entire body of concrete being deposited. Finishing jumbo fitted with outsized troweling plates follows slip form on same rails to remove any irregularities. Slip form tows jumbo by cables attached to winch, allowing variation of distance between two units as conditions dictate. Closely following this equipment, another jumbo, self-propelled, serves as working platform for finishers. All equipment was designed by Hubert H. Everist, Sr., West Coast contractor, and fabricated according to his specifications.





CANAL TRIMMER used by contracting firm of Hubert H. Everist, Sr., on Westley wasteway 3 miles northwest of Westley, Calif., cuts 600 lin ft per day. Power is furnished by D13000 Caterpillar diesel electric set at field cost of 50 cents per hour. After canal is excavated to 6 in. above final subgrade by draglines, trimming machine removes final 6 in., leaving accurate subgrade to receive concrete. Canal section is 14 ft wide at bottom, 9 ft deep, 42 ft across top and has $1^1/_2:1$ side slopes.

Engineers' Notebook

Railroad Rails Serve as Reinforcing Steel in Secondary-Road Bridge Construction

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Huntington, W. Va.

DURING THE RECENT WAR, reinforcing steel was unavailable for secondary-road bridge construction. In emergency, used or re-rolled steel rails were substituted. West Virginia being a coal mining territory, many structures have been built using mine rails and railroad rails as reinforcement. Spacing and effective depth never being considered, the structures evolved like "Topsy," from cerebral temperatures of the builder.

Plank flooring, spiked to nailing strips bolted to the web of 90-lb rails, 60 ft long, on 2-ft centers, has carried remarkably heavy loads. Sag is great with the loads, but speeds are reduced to minimize impact. Bridges of this type that have been in service in Logan County, W.Va., for years show no appreciable permanent deformation.

Railroad rails have a certain beam strength but the idea of using them as such is not generally prevalent. However, based on an observation of their use as beams through a period of years, and based on study and analysis of various empirical formulas, equations have been developed by which beam strength may be incorporated in their use as reinforcement.

In the conventional design of reinforced concrete beams and slabs, steel and concrete may be stressed to certain desired factors. From published tables, values of p and j may be selected, and a value of d may be found quite easily. There are many bar sizes, from which to choose, that meet the requirements of the steel ratio.

The use of rail reinforcement presents a problem quite in the reverse, not unlike "cutting the boy to fit the pants instead of cutting the pants to fit the boy"! There is a fixed steel area with which to deal. If steel and concrete were to be stressed as in the case of bar reinforcement, the ratio of A_s over bd would space the rails entirely too far apart and the value of d would be much too small. To bring b in smaller, d must be made larger (steel stressed lower and concrete higher).

Assume that an ASCE No. 8540 rail is to be used as reinforcement. Consider the centroid as the center of steel in solving for d. The area is 8.33 sq in. With a known moment of 46.55 ft-kips, solve for b with an assumed value of d = 12 in. For brevity, examine the Handbook on Reinforced Concrete Design, published by the ACI, from the report of Committee No. 317.

Solve first for the moment of compressive stresses about the tensile reinforcement (see Fig. 1), with steel at 8,000 psi, n at 10, and concrete at 1,800 psi.

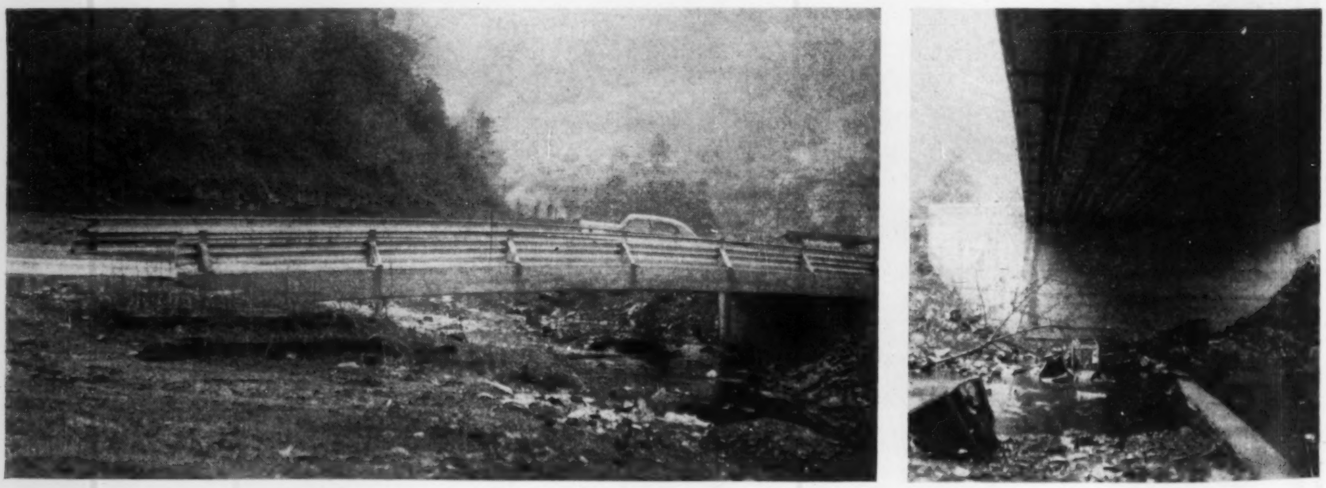
$$\begin{aligned} M_r &= KF \text{ (in ft-kips) (8), page 46} \\ F &= bd^2/12{,}000 \\ &= 12 \times 144/12{,}000 \\ &= 0.144 \text{ (Table 4)} \\ K &= {}^1/_2\, fc\cdot k\cdot j = 0.5 \times 1{,}800 \times 0.693 \times 0.769 \\ &= 480 \text{ (Table 1)} \\ M_r &= 480 \times 0.144 \\ &= 69.12 \text{ ft-kips} \end{aligned}$$

or

$$\begin{aligned} M_r &= {}^1/_2\, fc\cdot b\cdot k\cdot d \times j\cdot d = 0.5 \times 1{,}800 \times 12 \times 0.693 \times 12 \times 0.769 \times 12 \\ &= 69.12 \text{ ft-kips.} \end{aligned}$$

To have a balanced couple, that is, $M - KF = 0$, F should be M/K or $46.55/480 = 0.097$.

$$\begin{aligned} &\text{Then } M = && 46.55 \\ &\text{and } KF = 480 \times 0.097 = && \underline{46.55} \\ &\qquad\qquad \text{Difference} = && 0 \end{aligned}$$



CONCRETE BRIDGE (left) has 12-in. camber jacked into rail reinforcement, with $^7/_8$-in. round bars on 12-in. centers welded to tops of rails. Heavy abutments (right) consist of rails driven to refusal to meet each reinforcement rail before pouring of concrete.

With $F = \frac{bd^2}{12,000}$ (assuming d = 12), bd^2 should be 12,000 × 0.097 = 1,164 and $\frac{1,164}{144}$ = 8 in. for value of b. This is closer spacing than necessary and E_s/E_c at 10 is high.

Assume stresses at 8,000/15/1,200; K at 320. Then $F = M/K$ = 46.55/320 = 0.146, and bd^2 = 12,000 × 0.146 = 1,872 with d = 11 in. Then b is 1,872/132 = 14.18. The factors of A_s would be 12/14 × 8.33 = 7.14. The steel ratio or p is A_s/bd = 714/(14 × 11) = 0.046.

Through use of the formulas it can be proved that with this value of p, j and k can be ascertained, and d will be 11 in. with b = 14 in.

Other rails may be calculated in the same manner, that is, by solving for the moment of compressive concrete stresses about the tensile reinforcement. With feasible values of b and d, with compressive reinforcement not required, find the values of p, j and k and proceed with the design.

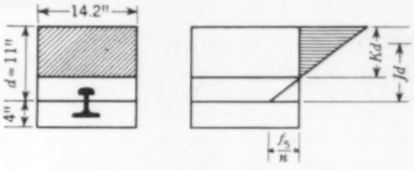


FIG. 1. DATA FOR typical rail-reinforcement design problem include M = 46.55 kips, n = 15, d = 11 in., b = 14.2 in., kd = 7.6 and jd = 8.5.

A spacing of 14.18 in. was used in the above calculations because the author has constructed several bridges using Flex-beam guard rail between 60-ft rails, spot welded to the top of the rail base, and the concrete placed with the guard rail left intact. Although designed for an H-10, S-8 loading, this bridge has been crossed by many 20-ton loads during the past two years without developing cracks or apparent deformation.

Calculating Machine Furnishes Shortcut Method of Computing P.I. of Two Lines

HENRY G. WEISSENSTEIN
Baltimore, Md.

COMPUTING THE COORDINATES of the point of intersection of two lines is a rather tedious process if done the conventional way using the law of sines. With the help of a calculating machine considerable time can be saved using the method shown in this article.

Step 1: Tabulate the given data as shown in the example, Table I.

Write in the first two lines the coordinates of the given points (East and North positive, West and South negative), the bearing of the line through each point, and the tangent of the bearing, as shown. In Col. 4 the line in which the tangent has the larger absolute value is designated as No. 1, the other one as No. 2. The algebraic difference between the tangents (tan B_1 − tan B_2) is written in the third line in Col. 6. The sign of this number is always equal to the sign of tan B_1.

The position of the change lever (Col. 7) depends on the signs of the coordinates and tan B_1. The following simple rule can be used: If the number of minus signs in the line designated No. 1 is even, the change lever is set at "×"; if the number of minus signs is odd, the change lever is set at "÷." Note the position of the change lever in Col. 7.

Step 2: Set the decimal points on the machine. The number of decimal places in the upper dials (multiplier dials) will be one more than the number of decimal places in the desired results. The number of decimals in the keyboard is equal to the decimals of the trigonometric functions used. The number of decimals in the lower dials (product dials) is equal to the sum of the two. (In our example there are 3 decimals in the upper dials, 7 in the keyboard, 10 in the lower dials.) The change lever is set at the position indicated in Col. 7. Neither the decimal points nor the change lever will be changed during the calculations.

Step 3: The figures in the line designated No. 1 are set on the machine in the following order:

Easting (or Westing) on the lower dials
Northing (or Southing) on the upper dials
Tangent of the bearing on the keyboard

Step 4: Change the upper dials to the Northing (or Southing) of point in line No. 2, then clear the keyboard only.

Step 5: Set tan B_1 — tan B_2 (third line, Col. 6) on the keyboard.

Step 6: By appropriate positive or negative multiplication, change the figures in the lower dials to the Easting (or Westing) of the point in line No. 2. Copy the Northing (or Southing) of the point of intersection with all decimals from the upper dials to the computations (third line, Col. 3). In our example it is: +14,040.855. Clear nothing.

Step 7: Change the upper dials back to the Northing (or Southing) of the point in line No. 2. Clear the keyboard.

Step 8: Set the tangent of the bearing in line No. 1 again on the keyboard.

Step 9: Change the upper dials to the Northing (or Southing) of the point of intersection found in Step 6. Copy the Easting (or Westing) of the point of intersection from the lower dials to the computations (third line, Col. 2). In our example it is: −8,700.41.

This completes the calculations. Sometimes it may be necessary to obtain the distances from the given points to the point of intersection. They can easily be computed from the coordinate differences and the sines and cosines of the bearings. The distances of our example are: X-Z: 1,254.55 and Y-Z: 3,134.33.

TABLE I. COORDINATES COMPUTED BY CALCULATING MACHINE

(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Coordinates					
Point	E or W	N or S	No.	Bearing	Tangent	CL
X	− 8,325.04	+12,843.77	(2)	N 17°24′36″ W	−0.313 572 7	÷
Y	−11,792.23	+13,526.42	(1)	N 80°33′12″ E	+6.010 126 6	
Z	....	....			+6.323 699 3	

... THE READERS *Write*

Transformed-Area Method of Concrete Analysis Questioned

To the Editor: I have read with considerable interest Professor Thompson's article, "Tests Verify Accuracy of Transformed-Area Method of Predicting Beam Stresses," in the July issue. Professor Thompson and his associates are to be congratulated upon the care with which their research work is conducted. I must confess, however, more than a considerable reluctance to accept the implied compliment to the *transformed-area method.* Although it might be disappointing if many engineers *lacked confidence in* or *doubted the validity of* the formulas developed by the transformed-area method, it would be equally disappointing if such formulas were to be complacently accepted as the sine qua non of reinforced concrete analysis.

Certainly, it is one thing to have *measured values* of E_c and E_s available for research purposes, and quite a different thing to attempt to hazard a guess as to the probable values of E_c or n for a proposed structure. In fact, what should be the basis of such selection and how will it affect the ultimate strength or cost of the structure? It is also one thing to compute the position of the steel relative to the neutral axis with a degree of precision of about 1 in 50,000 for research purposes, and still another thing to assure the placement of steel within $^1/_{16}$ in. of the assumed value in a 14-in. beam (a precision of about $^1/_{200}$). Furthermore, it is one thing to check the transformed-area formulas against static test conditions within the elastic action of a beam, and yet another thing to determine the allowable load of the same beam based upon its ultimate carrying capacity.

It might be interesting and worth while, from an educational viewpoint of presenting the complete truth to students, to promote the presentation of a comparison between the transformed-area formulas and the results from the many tests conducted on reinforced concrete during the past 40 years. When it is realized that the percentage of steel required to ultimately develop 3,000-psi concrete in a beam is in excess of 2.5 percent, one is inclined to wonder why it should be necessary to check compressive strengths by the transformed-area formulas when steel percentages are in the vicinity of 1 percent. Allowable values of M/bd^2 by the transformed-area method are very unconvincing after a careful study of all available test data.

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Lincoln, Nebr.

Cites Problems of Engineer in Field of Management

Dear Sir: With reference to the article, "What Management Expects of an Engineer," by A. C. Rubel, in the June 1947 issue (page 58), I would like to know if Mr. Rubel defines "management" in a figurative or literal sense. It appears to me that he leans to a figurative definition for he has apparently lost sight of the fact that supervisors of *all* categories are interposed between the engineer and management.

I agree that the nine expectations of management, outlined by Mr. Rubel, are ideal, and I think that the engineer who has visions of rising in management as well as his profession should use them as beacons toward the realization of his aspirations. The engineer who succeeds in reaching the small place in the apex of the cone of management can credit his success in no small measure to his knowledge and ability to practice the tenets of the nine points referred to.

However, it is my observation that Mr. Rubel has failed to include management expectations for coping with the problem of active and passive resistance on the part of supervisors who are between the aspiring engineer and the apex of the cone in not infrequent campaigns of well-directed antagonism.

Let us assume that all engineers in the employ of the X Company have been told by the vice-president of the company, "Your job is to get my job," and that the vice-president has been saying the same things to new engineer (and other) employees for the past 15 years. There is but one job to fill and, perhaps, 50 aspirants, and the aspirants have established their personal seniority lists. The youngest employee of this group may be smart, aggressive, and well informed on the nine points of management expectation. He may conceive his own long-term plan for getting the vice-president's job and quite innocently attempt to move closer to the goal, without awaiting his turn in the seniority lists as they exist in the minds of others who aspire to the same goal. The result is 49 against one as the seniority lists must be observed.

Has Mr. Rubel ever encountered the supervisor who shelved the ideas of subordinates—ideas which could mean profits to the company—because the adoption of them might reflect too much credit on the ability of the younger man? Has he ever encountered the supervisor who didn't shelve the ideas, but who carried them out without once giving credit to the man who conceived them—this is the supervisor who assumes all credits but who passes all liabilities down to subordinates. What would be Mr. Rubel's suggestion to the junior employee who attempted to carry his shelved ideas over the head of his immediate supervisor and was told by the higher supervisor that the idea must first bear the approval of the immediate supervisor before it could be made a part of company methods?

Too often, it is true, supervisors are busy men occupied with their *own* problems. Until those supervisors can be taken to task and made to work on the problems of *management* the ratio of engineers in management will be small—not because the engineer lacks ability or fails to understand what management expects of him but because too many supervisors are so busy with their *own* problems they get lost in a maze of their own design.

I believe Mr. Rubel should make his tenets of management expectation complete by adding that, once an engineer is in the process of rising to the small apex in the cone of management and is supervising the work of subordinates, management considers it his bounden duty to encourage the initiative of the subordinates by wise counsel which is not tainted with the least trace of personal gain, giving credit where credit is due, and at all times remembering that management cannot survive on personalities.

J. W. Darling, Assoc. M. ASCE
Public Claims Division,
Philippine War Damage Commission
c/o Postmaster
San Francisco, Calif.

SOCIETY *NEWS*

EDITORIAL:

Vote by October 7th

BALLOTS FOR expression of opinions by the Corporate Members of the ASCE have been distributed, and October 7, 1947, has been set as the day for counting them, in connection with the Constitutional Amendments enfranchising Juniors and increasing Society dues. More so than on any issue before them in recent years is it essential that all those eligible to vote should cast a ballot.

On the decision made in this balloting rests the future course of this Society. As has been pointed out in discussions at Local Section meetings and in articles in CIVIL ENGINEERING in the past several months, the question to be answered is: Shall the ASCE continue to pursue aggressively the professional and economic welfare policies that have attracted some 7,000 Juniors to the Society in the past quarter century, or shall the Society return to the purely technical status it occupied during the first 70-odd years of its existence?

The interrelationship between the enfranchisement of Juniors and the increasing of Society dues was emphasized at the Society's Summer Convention in Duluth. There the proposed Amendment to increase dues for Juniors $2.50 per year was amended from the floor. The change provides that dues for Juniors, prior to age 32, be set at $12.50 per year. This will place all Juniors everywhere on a common dues level, by reducing $2.50 per year the dues of the some 600 Juniors residing in the New York City area who now are paying $5.00 per year more than Juniors in the other areas, just as the other grades of members in the Metropolitan area pay $5.00 per year more than members elsewhere. New York members, except the Juniors, will continue to pay $5.00 a year more dues than Corporate Members and Affiliates living outside the New York Metropolitan area if the dues Amendment carries.

As stated in a pamphlet recently sent to the Corporate Membership on the proposed Amendments, Members who favor the Amendments and desire an aggressive continuation of the Society's professional and economic activities should be willing to back their views with the nominal increase in dues necessary to offset current increased costs and to maintain the broadened scope of Society activities which have developed over the last 26 years sinec present dues were established. Just being in favor of the Amendments is not enough, as ASCE Constitutional Amendments, to be accepted, must be adopted by a two-thirds majority of those voting.

Be sure to vote before October 7th.

President Vetoes National Science Foundation Bill

URGING PASSAGE OF a revised bill for peacetime mobilization of the country's scientific resources, President Truman vetoed the bill providing for a National Science Foundation sent him by the first session of the Eightieth Congress. The bill was passed by both Houses of Congress shortly before their adjournment, after two years of effort on the part of the nation's leading engineers and scientists to obtain such legislation.

As noted in previous issues of CIVIL ENGINEERING (March, April, and September 1946, and May 1947), Engineers Joint Council has been instrumental in getting engineers mentioned in the bill finally passed by Congress. Boris A. Bakhmeteff, Hon. M. ASCE, served as chairman of the EJC Panel for promoting the interests of engineers in a National Science Foundation.

In vetoing the bill, intended to replace the wartime office of Scientific Research and Development, President Truman voiced his disapproval of the measure sent him for signature. In particular, he criticized the projected organization of the foundation, stating that the bill, in effect, would "vest the determination of vital national policies, the expenditure of large public funds, and the administration of important Governmental functions in a group of individuals who would be essentially private citizens."

The President, who has repeatedly sponsored formation of a National Science Foundation, urged that Congress, when it returns to its second session in January, "reconsider and pass an acceptable bill."

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Society Business Meeting to Be Held October 7

A REGULAR MEETING of the Society will be held in the Engineering Societies Building, 33 West 39th Street, New York, N.Y., on the evening of October 7, 1947, at 8:00 p.m. The sole purpose of the meeting is to canvass the ballots on the proposed amendments to the Constitution in regard to enfranchisement of Juniors and increase of annual dues.

This announcement is made in compliance with the requirement of the Constitution that Corporate Members shall receive official notice not less than 15 days in advance of the meeting. No other business will be considered.

Pros and Cons of Dues Increase Discussed

That the columns of CIVIL ENGINEERING are always open to members of ASCE for discussion of Society matters is well known. Some members of the Board of Direction, at the July meeting, expressed surprise that no member had expressed, for publication in CIVIL ENGINEERING, any argument against the proposed dues amendment. The Board directed, should such argument be submitted, that every effort should be made to find space to print it together with a counter statement.

In mid-June a letter was received from John Orth Cook, a member, stating that he and other members of the Pittsburgh Section of ASCE were considering the circulation to the Section of a statement against adoption of the dues amendment. Executive Secretary Carey replied on June 19 to Mr. Cook in part, as follows:

"Your letter indicates that you and some other members of the Pittsburgh Section, as individuals, oppose the proposed amendment to the ASCE Constitution for raising annual dues. You state that you are considering sending a memorandum to the Corporate Members of the Pittsburgh Section expressing your views against the amendment. If you have any sound argument against this amendment, why confine it to members of the Pittsburgh Section? Why not try, at least, to put your arguments before the entire membership through the columns of CIVIL ENGINEERING?"

Mr. Cook submitted on August 6, 1947, for CIVIL ENGINEERING, the signed "Letter to the Editor" published here.

Letter Questions Dues Increase

To the Editor, Civil Engineering:

We, the undersigned Corporate Members of the American Society of Civil Engineers, object to the proposed amendment relative to increase of dues and present to the membership our objections not only to the proposed amendment but also to the flood of propaganda issued by Society Headquarters and/or the Board of Direction.

In 1942–1943, conditions created by the ill-advised Wagner Act appeared to require some action to prevent the wholesale induction of engineers into labor unions; that condition has been met, union activities appear to have subsided, and probabilities are that they will further subside; Society aid would seem not to be required beyond occasional service.

A study of salaries was made and some improvements effected; that, also, would seem to require not more than routine service.

The Society has had and has been able to maintain a representative at Washington; we do not object to this activity but we do feel it can be carried on the present dues.

The Society has established three Branch Offices, at San Francisco, at Chicago, and at Washington, for reasons that we feel are not competently explained. The statement that these offices cost no more than the traveling expenses of a New York office man, does not seem too reasonable; we feel that these branch offices will continue to grow, in size if not in effectiveness, and will be a continuing drain upon Society resources; in particular, how can the Washington Branch Office 225 miles from Headquarters, be justified?

The Society has plunged headlong into miscellaneous activities. The statement has been made that the other Founder Societies are not bearing their full share of the cost. Perhaps they are wiser than the Civils. The Miners with 14,000 members, $15.00 dues, the Electricals with 26,000 members, $15.00 dues, the Mechanicals with 20,000 members, $20.00 dues, are all comparable in membership to the Civils with 21,000 members, $20.00 dues. Headquarters claims that average Civil dues are low because of the high percentage of Juniors and Life Members. While no check has been made it would seem that the others would have similar percentages of membership classes and they are getting along on their present dues.

The claim is made that one or more of the other societies undertake subsidized research which helps out on their budgets; this seems to us a proper activity for these societies and a very proper objective for the Civils rather than the proposed raise in dues.

Headquarters reports that Civil Engineering up to now has been a drain upon the resources of the Society but that this year it will show a small profit; as an objective we point out that the Iron and Steel Engineers' magazine pays around 85 percent of their expenses.

We dislike the flood of propaganda, part of which is misleading, issued by Headquarters and/or officials in support of the proposed amendment. We cite from Civil Engineering, March 1947, Editorial, page 47, " . . . it is urged that all Corporate Members asked to sign such petitions do so, regardless of whether or not they share President Hastings' confidence. . . .," and presume it was upon this basis that some of the members signed. We cite again from Civil Engineering, May 1947, Editorial, page 50, the misleading statement that "All four ASCE zones sign petitions—ask amendments raising dues. . . ."

The real owners of the American Society of Civil Engineers are the Corporate Members. The Board of Direction and the Secretary's Office are employees of the Corporate Members, elected or appointed to conduct the business of the Society in accordance with the Constitution and By-Laws. We feel that these officers have not made a fair presentment of the proposed amendment but have spent Society funds on trips made solely for propaganda purposes and on printing and circulating biased propaganda, all in an attempt to justify their prior expenditures.

We marvel at the frantic cries to the effect that "All is lost unless we get $5.00" and we are puzzled over the real impetus behind the personal appeals to members and to Sections asking that their influence be used to secure votes, willy-nilly, in favor of the amendment. Formerly, the American Society of Civil Engineers was a dignified body. Has that dignity been entirely lost in pursuit of the almighty dollar?

After all, there are arguments against the amendment. $5.00 is not an immaterial sum to many members who desire to remain in the Society; to the borderline members, men whose activities are no longer centered in engineering but who remain in the Society for one reason or another, the additional $5.00 may be the last straw. Do we want to lose these men?

In the final analysis, is membership in the Civils worth $25.00 to the average member?

(*Signed*)

John Orth Cook	F. R. Burnette
L. Spalding	Harry G. Appel
A. K. Darbaker	

The Executive Secretary, in compliance with Board of Direction instructions, prepared comment on the letter, and transmitted a copy of the letter and comment to the following members of the Society: President E. M. Hastings, Past-Presidents Malcolm Pirnie, J. C. Stevens, W. W. Horner and Presidential Nominee for 1948, R. E. Dougherty.

The statement here submitted regarding Mr. Cook's letter of August 6 was put in final form by the Executive Secretary with assistance and suggestions by the members of the Society above named. It is presented as an answer jointly authored by these five members and the Executive Secretary.

Comment on Dues Increase Objections

Re Par. 1. Members of the Board would have been remiss in their duty had they failed to try to bring before the members of the Society the facts and the reasons behind Board action toward bettering the financial condition of the Society. The columns of Civil Engineering form the proper medium for presenting these facts to our members. These Board-inspired statements, cannot truthfully be termed "propaganda." They have been but a presentation of facts, with an admonition to readers to study the facts and, by all means, to vote.

Re Par. 2. Anyone who expects labor unions now to "subside" since the new labor bill has passed, would appear to be woefully uninformed as to the publicly-announced determination by both CIO and AF of L to continue their fight against this law. The "Society aid" to members threatened with being enmeshed against their will within the net of trade unions, which the letter indicates could be reduced to an "occasional service," has been rendered by our three field representatives and Society Headquarters during the past two years. Such service has been but "occasional." But when that service has been requested, it has been badly needed—and quickly. The Board of Direction believes that the Society should continue to render such service to members when the situation demands it, so far as Society personnel, finances and legal limitations will allow.

Re Par. 3. Just what the authors of the letter are objecting to here is not clear. A Society "Committee on Salaries" has existed for several years. This committee is the author of the recently developed Interim Report on engineer job classifications and salaries, as published in the November 1946 issue of Civil Engineering. The committee is giving further study to the subject, with particular attention to the salaries of engineering educators. An employee of the Headquarters office gives part of his time assisting the committee. The efforts of the Committee on Salaries and ASCE special surveys have resulted in many instances in better salaries for engineers. Some large engineering firms have adopted the recent ASCE job classification and salary schedule as base rates for their employees. Do the authors of this letter advocate that the Committee on Salaries be discharged and that all effort by ASCE for better salaries for engineers should be dropped except for "routine service," whatever that may mean?

Re Par. 4. The authors of the letter "do not object" to maintaining an Eastern Representative of the Society in Washington but believe his activities can be maintained there without increase in Society income. What office of any kind can be maintained today on the same budget of ten or even five years ago? It should be obvious that if the office of the Eastern Representative of ASCE is to be maintained by the Society in Washington, D. C., or any other place, additional Society income must be provided to maintain it.

Re Par. 5. The language of the letter indicates that the need for any field representative in Washington or elsewhere never has been "competently explained" to the writers who apparently have not read Civil Engineering for the past two years very carefully. Incidentally, the office of the Western Representative is in Los Angeles and not in San Francisco.

Ours is a professional Society. As such, it exists solely *to serve* its members and the public. That is the essence of professionalism. Former Boards of Direction, representative of every geographical area of our membership and responsible for the policies and activities of the Society, decided that the best and most economical way to bring the services of the Society adequately to the members and the public was through three field offices in addition to the Headquarters office in New York. Cost experience with these field offices has proved the soundness of the decision. Failure to provide funds to maintain these modest field offices, only one of which boasts even a stenographer, will merely result in a discontinuance of an important fraction of reasonable Society service to its members and the public.

Re Par. 6. The statement that "The Society has plunged headlong into miscellaneous activities" is not borne out by the record. Articles in Civil Engineering published after Board meetings at least four times every year since Civil Engineering began in 1930, show clearly that the change from a purely technical Society to one active in both technical and professional fields has been no "headlong" plunge but a slow, and carefully step-by-step transition. The same thing has happened in the other Founder Societies. Some of these changes have been pioneered by the Mechanical Engineers and some by the Electricals, but ASCE has been the leader in many of them.

Where the societies join for a common purpose, as they have done in Engineers Joint Council, each participating society pays its proportionate share of the cost of joint operations. Any statement that the other Founder Societies "are not bearing their full share of the cost" of joint operations in the interest of the professional advancement of engineers and engineering is not a true statement.

It is completely misleading to compare ASCE dues with those of the other Founder Societies if the intent is to indicate that dues received by the other societies constitute about the same percentage of their total annual incomes. Engineers in the other societies are much closer than civil engineers to industry, manufacturing and commerce. These connections with industry provide other societies with major sources of income other than direct dues from members. For any increase in income of importance, ASCE has no other place to go except to dues from its members.

If the membership wants its Board of Direction to curtail Society activities in the professional and economic field, to discontinue many of them and to require the Society to relapse into a static technical group, ASCE can, as the letter suggests, "get along" with its present dues—at least until it dries up and dies. If, however, the Corporate Members of ASCE want the Society to continue to act aggressively on matters dealing with the professional and economic advancement of civil engineers and the engineering profession, there is no other alternative in these days of inflation and sky-high costs of everything but to raise Society dues.

Re Par. 7. ASCE always has been interested in promoting subsidized research along civil engineering lines. This is a highly desirable activity in the realm of technical advancement but it does not reduce the load on Society income.

It is entirely on the expense side, so far as the Society is concerned. But the results of the research projects subsidized by outside interests serve to enrich engineering knowledge for use by engineers in the practice of their profession. How "subsidized research" could directly increase Society income, as suggested, is difficult to see.

Re Par. 8. Eighty-five percent of ASCE budgeted expense for 1947 is nearly $600,000. To imagine Civil Engineering earning $600,000 net annually, which the letter suggests as an immediate possibility, is no less than fantastic, regardless of the earnings of the magazine of the Iron and Steel Engineers, *Engineering News-Record, Collier's* or any other magazine. Most readers of Civil Engineering will agree that the magazine has shown recent improvement in format and content, and every proper effort is expected to be made to increase reader interest. Continued improvement increases interest by advertisers. However, the primary purpose of Civil Engineering is to bring to the members matters directly concerning the activities of the Society and articles of immediate interest regarding civil engineering design and construction. Civil Engineering is not in the commercial advertising business except as a corollary to its primary purpose.

Re Par. 9. Already it has been shown that the "flood of propaganda" decried by the signers of the letter is less than a trickle, also that it is not "propaganda" in the deprecatory sense used in that letter. Facts often are called "propaganda" by objectors unwilling to face them.

A specific criticism cited relates to the announcements in Civil Enginnering regarding petitions. This is most difficult to understand. The only way a Constitutional Amendment can be brought before the Society is that it be initiated by petitions by at least 75 Corporate Members from each of the four zones of the Society. The Board, having decided that an amendment to raise dues should be brought to a vote, surely was within its rights to urge, through the columns of Civil Engineering, that members sign petitions so that the amendments might be brought to a letter ballot. It was assumed by the Editor of Civil Engineering and by the Executive Secretary that the membership at large would be interested in knowing that a sufficient number of petitions had been received from all four zones. To assign to these news items the connotation of "misleading" and "propaganda" seems hard hunting for something to criticize.

Re Par. 10. It seemed hardly necessary for Mr. Cook and the other signers of his letter to restate the patently axiomatic fact that the members of ASCE own the Society. The members of the Board of Direction, however, are not "employees of the Corporate Members" as the writers of the letter state. They must know that members of the Board are the elected representatives of all Society members, and should know that members of the Board "conduct the business of the Society" without pay. Twenty-six men on the Board every year donate freely of their time to the interests of their constituents, the time thus given running annually into many thousands of dollars in value.

No ASCE Board ever has claimed infallibility for its actions, and we do not recall that any ASCE Board ever before has been accused of bad faith in actions taken. Members of the Society have every right to criticize actions taken by the Director they have elected to represent them or to criticize actions by the Board as a whole. They have a right to criticize the Executive Secretary or other employees of the Society regarding the manner in which those employees carry out the directions of the Board. However, we seriously question the truth or the propriety of the statement in the letter that Society funds have been expended by members of the Board and Society employees for "circulating biased propaganda, all in an attempt to justify their prior expenditures."

Re Par. 11. To the writers of the letter it appears that published statements of the financial facts confronting the Society are "undignified" and that the "former" dignity of the Society has "been entirely lost in pursuit of the almighty dollar." In Paragraphs 7 and 8 of their letter they advocate more active and commercial pursuit of the dollar through proposed outright subsidies to the funds of the Society and transforming Civil Engineering into a commercial advertising vehicle. Apparently the dignity of the Society is thought to be adversely affected by pursuing additional dollars through a raise in dues, but not by the other methods proposed. The dignity and honorable standing of the Society have been reasonably well maintained for nearly a century and there can be but few who consider it now in jeopardy.

Re Par 12. There may be, as stated in the letter, "arguments against the (dues) amendment" but such arguments are not readily discernible in that document. As has been stated in Civil Engineering, the whole matter boils down to one simple question. Shall the Society continue its activities toward advancing the professional and economic interests of its members or shall it relapse into a purely technical and honor group of engineers? There is room for honest differences of opinion and argument on that question. An attempt to magnify beyond reason the importance of $5.00 is not such argument.

There can be few if any practicing engineers today whose annual expenditures cannot be stretched an additional five dollars, less than a dime a week for Corporate Members and $2.50 a year for Juniors, if they want to do so. No specious exaggeration of the size and importance of $5.00 or $2.50, spread over a whole year, can becloud the undeniable fact that every one of us squanders many times those amounts every year. Members of our Society are not on the economic level of Chinese peasants. We can pay the increased dues if we wish, and without privation or rigorous self-denial.

Re Par. 13. The last paragraph of the letter strikes its keynote, "Is membership in the Civils worth $25.00 to the average member?" the writers ask. Apparently these members doubt it. Up to now they must have considered membership in the Society worth $20.00 a year to Corporate Members and $10.00 to Juniors or they would not have retained membership. It is to the $5.00 and the $2.50 increases proposed that they object.

There can be no denial that common labor, skilled labor and civil engineers, as well as all others who work for a living, receive today considerably higher pay, salary or income than in 1940, or in 1921 when ASCE dues were set. When compared with pay for the same services on a 1921 basis, the difference frequently is in multiples of the 1921 scales. Increased incomes for civil engineers have gone along with the trend, and the activities of ASCE, particularly since 1940, have helped materially to keep the incomes of civil engineers generally abreast of the trend.

With increased incomes have come higher costs for everything. ASCE, like every individual and every business, has felt the impact of those higher costs. Industry, business and labor have raised their prices to the public. ASCE, until now, has been able to hold to its 1921 price tag on annual dues. The Society no longer can render to its members at the 1921 price, the services most of them appear to want. It must raise its price or reduce in quantity and quality the product delivered. ASCE cannot escape prevailing inflationary conditions any more than any other business can escape them. If we want ASCE membership and the present standard of ASCE service, common sense dictates that we must pay a 1947 price for it.

In the action taken by the members of the Board of Direction, elected by the members to conduct the business of the Society, they indicated clearly that they hope the big majority of the Corporate Members of ASCE will agree with them that membership in ASCE *is* worth at least $25.00 a year to Corporate Members and $12.50 to Juniors. The Board has taken the steps necessary to place a ballot in the hands of every voting member of the Society so that each may have his say as to the course his Society should now take. ASCE, indeed, stands today at the fork in the road.

California Engineers Amend Registration Act

DURING THE LAST hectic hour of the current session of the California legislature, near midnight on June 20, the State Senate passed Assembly Bill No. 1930 to amend the Civil Engineer Registration Act. By the persistent efforts of a patient group of professionally minded engineers working with state legislators, a bill introduced in the Assembly early in February was redrafted several times to meet requirements of professional groups and to preserve for civil engineers the professional standing they have built up and acquired since the civil engineer act became law in 1928. In its final form Assembly Bill No. 1930 became an amendment to the Civil Engineers Registration Act. The bill was signed by Governor Earl Warren without ceremony on July 17 and becomes law 60 days thereafter.

The amended registration act for professional engineers enlarges the former three-man State Board of Registration for Civil Engineers by four members also appointed by the Governor—one a chemical engineer, one an electrical engineer, one a mechanical engineer, and one a petroleum engineer. The amendment omits mention of mining engineers. It specifically exempts engineers in the communications industry from the requirement of obtaining a certificate, although they may elect to do so.

The new seven-man board will be known as the State Board of Registration for Civil and Professional Engineers. It is empowered to examine the qualifications of and to register professional engineers in the branches in which the applicant qualifies; and after investigation of complaints it has the authority and the duty to either reprove a violator of the act, in private or in public, or to suspend or revoke his license.

The amended act provides for the issuance of certificates to engineers-in-training, that is, to those who have had four of the six required years of engineering experience and who pass an examination on fundamental engineering subjects. Graduation from an approved school of engineering is considered the equivalent of four years of required experience. Not more than one year of postgraduate work likewise may be credited as required experience. Engineering experience in the armed forces gets the same consideration as comparable experience elsewhere.

Until June 30, 1948, applicants for the certificate of engineers-in-training will be registered without examination if they have an engineering degree from a school approved by the Board. A "grandfather clause" in the amendment also extends the privilege of registration without examination until June 30, 1948, to practicing engineers who submit evidence of competence to practice in one or more of the branches of chemical, electrical, mechanical and petroleum engineering. This privilege does not extend to unlicensed civil engineers desiring to practice. They must take an examination, the "grandfather clause" in the civil engineer registration act having expired.

Junior engineers may take the examination required by the amended law in two parts. After satisfactory completion of the first stage of the examination a certificate is issued as engineer-in-training. Any time after the completion of six years of experience, including his college work, an engineer-in-training may take the second stage of the examination to test his ability to apply his knowledge and experience to practice in his branch of engineering, and to take responsible charge of work in such branch.

In the amended law a professional engineer is defined as: "A person engaged in professional practice of rendering service or creative work requiring education, training and experience in engineering sciences, and the application of special knowledge of the mathematical, physical and engineering sciences in such professional or creative work as consultation, investigation, evaluation, planning or design of public or private utilities, structures, machines, processes, circuits, buildings, equipment or projects, and supervision of construction for the purpose of securing compliance with specifications and design for any such works."

The registration and the regulation of the practice of civil engineering, structural engineering and land surveying are not changed by the amended act. Persons not registered as civil engineers are prohibited from practicing, or offering to practice, civil engineering and from using the title. The amended law, however, only entitles persons registered under it to use the title of professional engineer and according to registration with the Board the additional titles of civil engineer, chemical engineer, electrical engineer, mechanical engineer, petroleum engineer, or engineer-in-training. Civil engineers already registered by the Board are permitted to use the title of professional engineer without further fees or examination.

Nearly 5,000 civil engineers hold active certificates of registration in California. Estimates indicate that an equal additional number of professional engineers will be registered by the new seven-man Board of Registration for Civil and Professional Engineers.

As mentioned in the June issue of CIVIL ENGINEERING, page 51, leadership for the cooperative movement to obtain a broader registration law for the engineering profession in California was furnished by the Los Angeles Engineering Council of Founder Societies, of which Wallace L. Chadwick, M. ASCE, is president.

"Civil Engineering" Has Seventeenth Anniversary

WITH THE PRINTING of the September 1947 issue, CIVIL ENGINEERING completes its seventeenth year of service to its readers.

The policies of this publication have not changed materially from those defined by President John F. Coleman in the signed statement that prefaced the first issue, October 1930, in which he said, "With a freer style than was suitable for PROCEEDINGS, it will take over from that publication the portion susceptible of a treatment characterized by brevity and vivacity. It will be the medium of communication with the membership on Society activities: technical, professional and administrative. It will deal with those interests of the civil engineer that become vibrant as a consequence of the new Functional Expansion Program."

Thus CIVIL ENGINEERING had a well-defined editorial policy from the beginning. Its service in reporting Society activities has been understood and accepted by all Members of ASCE, but its policies pertaining to technical articles may need clarification. CIVIL ENGINEERING articles should be on subjects of vital interest to its readers as evidenced by membership in its 13 Divisions, and somewhat representative thereof in quantity of material published. They should be of wide, general interest as opposed to highly technical articles read and understood by but a few experts.

Indicative of the general scope of CIVIL ENGINEERING are the many departments that appear in this 204th issue of the publication. These departments permit a thorough coverage of subjects of interest to readers of CIVIL ENGINEERING, give them a voice in Society affairs and provide outlets for talented contributors.

Advance Planning Statement Is Presented to Senate Subcommittee

For many years the Society has advocated the principle of federal financial assistance to state and local governments to aid them in advance planning of local public works, predicating its stand on the basis not of grants-in-aid or outright gifts, but of loans to be returned to the federal treasury when project construction is started. There are many sound reasons for supporting that type of program.

The War Mobilization and Reconversion Act of 1944 placed responsibility for administering such aid in the Federal Works Agency. As a result, well over two billion dollars worth of local public works projects have been planned, distribution being spread throughout the country. Unfortunately, authorization expired on June 30, 1947, and Congress did not act to extend the program.

At its April meeting, the ASCE Board of Direction passed a resolution reaffirming its support and recommending continuance of the then-existing program. Subsequently appropriate legislative bills were introduced in both the Senate and the House. On July 11, a committee hearing was held on the Senate bill and a supporting statement, in behalf of the Society, was presented by E. M. Chandler, ASCE Eastern Representative. The subcommittee which conducted the hearings rendered a favorable report to the Senate Public Works Committee, but no report emerged from that body. No action was taken in the House. There the matter rests.

It is expected that the matter will be pressed further in the next session of Congress, and those who believe in this worthy means of encouraging sound planning of needed public works projects should be prepared to present their views.

Salary Survey Indicates Engineering Teachers Are Underpaid

ALLEN P. RICHMOND, M. ASCE
Assistant to the Executive Secretary

Since early this year the Committee on Salaries has given its attention exclusively to a study of the salaries of engineering teachers. Seventy-one usable returns have been received from a questionnaire sent in May to the 104 engineering schools whose civil engineering curricula are accredited by Engineers' Council for Professional Development.

In the field of engineering practice, proper classification of positions depends on a systematic evaluation of factors related to the duties, responsibilities, and prerequisites of each job. The Committee believes that the classification of teaching positions also should depend on an evaluation of similar characteristics.

Therefore each teaching position is being evaluated in terms of academic degree requirements, experience, and five responsibilities—for supervision exercised, for policy and methods, for public relations, for records and reports, and for machinery, equipment, and safety (another responsibility, for committee work and non-academic duties, was considered, but was discarded when the data collected appeared to be inconclusive).

Each factor has been divided into from three to nine parts or steps in ascending scales. A block of numbers has been assigned to each factor according to its relative importance, and then subdivided according to the steps or divisions adopted for that factor. These numbers are designated "points" and constitute a system of weights for evaluating jobs.

The study is still under way but one of the first tabulations is of such immediate interest that it is presented in Table I. This tabulation relates point values to actual starting salaries for each of the usual academic ranks, as those salary rates were reported by institutions. Point values are shown under headings of median value, interquartile range, and the minimum-maximum range of points. Similarly the median rate of starting salaries is shown, the interquartile range, and the minimum-maximum range.

The median is the middle value in a series of values when arranged in order of rank. Therefore 50 percent of the values are larger than the median and 50 percent smaller. The interquartile points are the values such that 25 percent are larger than the upper quartile and 25 percent are smaller than the lower quartile. This interquartile range therefore contains the middle 50 percent of all values in the series. Since equal numbers of extremely high and extremely low values have been balanced out, the interquartile range may be considered as the prevailing range of the data in the series.

Study of the rating sheets shows a close correlation between the point values of a particular position and the salary paid for that job, much closer than exists between the simple title (e.g., instructor, assistant professor, associate professor, or professor) and the salary that goes with that title.

Because of the diverse practice at the various schools as to the teacher's obligation for nine months, ten months, twelve months, or some other period of service, together with the possibility that this question was not adequately phrased in the questionnaire, it was decided to accept without change the rates as reported as the normal year's compensation paid for teaching. The reasons for this decision will be discussed in the final report.

Although the study is incomplete at present, it is believed that the Society membership should be promptly informed of progress to date. The above tabulation confirms the general belief that a distressingly large number of engineering teachers are underpaid. It is hardly necessary to point out that this situation is a matter for the serious concern of every member of a profession which leans so heavily on engineering teachers and their work.

TABLE I. ENGINEERING TEACHING SALARIES, SPRING 1947

	Point Values				Starting Salaries			
	No. of institutions for which positions were evaluated	Median	Interquartile range	Min.-max. range	No. of institutions for which rates were reported	Median	Interquartile range	Min.-max. range
Instructor	71	159	150–170	126–252	71	$2,500	$2,400–2,900	$1,800– 4,280
Asst. Prof.	71	228	206–245	162–297	71	3,300	3,000–3,600	2,400– 4,400
Assoc. Prof.	69	304	278–328	209–386	68	4,000	3,600–4,400	2,700– 6,000
Professor	69	368	331–404	218–505	69	4,600	4,200–5,100	2,900– 9,000
Dept. Head	64	478	444–516	342–665	63	5,000	4,600–6,000	3,250–10,000
Dean	42	605	555–650	463–700	37	6,300	6,000–7,250	4,450–12,400

World Engineering Conference National Committee Organized

PARTICIPATION BY ENGINEERS of the United States through a U.S.A. National Committee for World Engineering Conference is now being organized under the Committee of International Relations, Engineers Joint Council.

A World Engineering Conference was organized in September 1946 in Paris, France, as successor to the International Technical Congress which held its final meeting at that time. The previous meeting of the Congress was in Tokyo in 1929.

By official action of the boards of direction of the American Society of Civil Engineers, American Society of Mechanical Engineers, and American Institute of Chemical Engineers, these societies have become the sponsors for the American Committee, the first meeting of which was held August 4, 1947, at which time a charter for the Committee was adopted.

The charter states the functions of the Committee to be as fo'lows:

"The function of the U.S.A. National Committee for the World Engineering Conference is to provide an organization through which engineers in the United States of America may participate in the World Engineering Conference and thereby contribute to the International understanding so necessary to world peace.

"It is the purpose of the Committee to foster cooperation between the engineers and engineering societies in the various nations of the world. It is not the purpose of the Committee to duplicate existing international agencies or provide a fixed channel for communication between existing agencies in the different countries. By suitable publication of existing international interchanges, the Committee may apply a helpful coordination that will reduce confusion and assist communication.

"Specifically, the Committee shall select the representatives of U.S.A. on the Council of the World Engineering Conference and shall provide the funds for participation to the extent desired, by the Committee, in the World Engineering Conference."

The charter goes on to establish the role of sponsoring societies and of member societies at national, state, and local levels. There is provision for an executive board of three representatives from the sponsoring societies, three from other national societies, and three from the group of state and local organizations. Provision also is made for meetings, finances, and future membership of organizations.

Eight representatives of the three sponsoring societies have been constituted an executive board pro tem during the organization phase of the Committee. The representatives of ASCE are B. A. Bakhmeteff, Hon. M. ASCE, F. B. Farquharson, M. ASCE, and E. P. Goodrich, M. ASCE. Invitations to join the U.S.A. National Committee for World Engineering Conference will be issued shortly to national engineering societies and organizations, and later to state, regional, and local societies.

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Leon S. Moisseiff Award Is Established by Board of Direction

IN RECOGNITION OF the professional accomplishments of the late Leon S. Moisseiff, M. ASCE, the Broad of Direction of the Society has established a memorial prize for excellence in the field of structural analysis. This award is to be given annually to the writer of an important paper in the current volume of TRANSACTIONS, dealing with the broad field of structural design—including applied mechanics as well as theoretical analysis —or constructive improvement of engineering structures, such as bridges and frames, of any structural material.

The award will be financed from a fund raised by two committees—the Leon S. Moisseiff Memorial Committee and the Leon S. Moisseiff Memorial Committee, Inc.—and turned over to the Society. Subject to ratification by the Board of Direction, the Executive Committee of the Structural Division of the Society will select the recipient of the award, which will consist of a bronze medal and a certificate signed by the President and Executive Secretary of the Society.

Mr. Moisseiff, who was born in Latvia in 1872 and died at Belmar, N.J., on September 3, 1943, greatly enriched the field of structural engineering by his career. In 1895 he was graduated from Columbia University, which in 1939 awarded him the Egleston Medal for distinguished engineering achievement. For a number of years Mr. Moisseiff served as designing engineer in the bridge department of what is now the New York City Department of Public Works. It was while working on the design of the Manhattan Bridge for the city that Mr. Moisseiff and some of his associates in the department made the first practical application of the deflection theory, which had originally been worked out by others but never applied.

After leaving the employ of the city in 1915, Mr. Moisseiff became a consultant on bridge design, participating extensively in the design of such notable suspension structures as the George Washington and Whitestone bridges in New York, the Philadelphia-Camden Bridge, and the Golden Gate Bridge in San Francisco.

Prizes awarded Mr. Moisseiff, in addition to the Egleston Medal, include the Franklin Institute Medal for 1933 and the Society's Norman Medal (1934) and James Laurie Prize (1939). He was the author of numerous works on bridge design and the theory of structures. His last published paper, written in collaboration with Frederic Lienhard, M. ASCE, appeared in the 1941 TRANSACTIONS of the Society.

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Tellers Canvass First Ballot for 1948 ASCE Officers

August 1, 1947

To the Secretary
American Society of Civil Engineers:

The tellers appointed to canvass the First Ballot for Official Nominees report as follows:

For Vice-President, Zone I

Carlton S. Proctor	299
Charles B. Breed	94
Scattering	159
Void	1
Blank	13
Total	566

For Vice-President, Zone IV

William D. Shannon	366
John W. Cunningham	243
Frederick W. Panhorst	50
Scattering	194
Void	18
Blank	18
Total	889

For Director, District 1

(Two to be elected)	
Edmund A. Prentis	264
William McKenna Griffin	262
Scattering	147
Void	0
Blank	3
Total	676
(One half of above figure)	338

For Director, District 4

Joel DeWitt Justin	245
*Ineligible Candidate	12
Scattering	9
Void	1
Blank	0
Total	267

For Director, District 11

Julian Hinds	139
Donald H. McCreery	88
Wallace L. Chadwick	50
Scattering	32
Void	9
Blank	0
Total	318

For Director, District 14

Webster L. Benham	176
Norman H. Moore	107
Scattering	10
Void	0
Blank	0
Total	293

For Director, District 15

C. Glenn Cappel	136
Berkeley Johnson	31
Scattering	42
Void	0
Blank	2
Total	211

Ballots canvassed	2,882
Ballots withheld from canvass:	
From members in arrears of dues	43
Without signature	2
Total number of ballots received	2,927

Respectfully submitted,
George T. Gilman, *Chairman*
R. Edward Kuhn, *Acting Vice-Chairman*

W. H Dieck
S. Clifford Doughty
Rudolph Evers
M. O. Elkow
Michael E. Fiore
Francis B. Forbes
Henry Goldfinger
George H. Harp
Howard Holbrook
H. F. Hormann
Harry Newman
Frederick W. Ockert

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* These votes were cast for an incumbent officer who is presently ineligible for reelection in accordance with Section 5, Article V of the Constitution.

"Ever Read Your Yearbook?"

Condensed from item by R. Robinson Rowe, published in the August 1947 issue of the Sacramento Section publication, "The Engineerogram"

The 1947 Society Yearbook was the first complete edition since 1945, so it was probably received with unusual curiosity and interest. Even so, it is a safe bet that not more than one member in ten did more than riffle it through to see if his name and address were correct before squeezing it into the bookcase for future reference.

Somehow, though, each of us has paid a dollar or so for the Yearbook and it is reasonable to look into it further and try to get our money's worth. Those interested in names and statistics will find plenty.

Looking at the names from Aanonsen to Zwerner, you might riffle through looking for short ones and long ones, finding that surnames range from two letters (Ax, Hu, Ja, Ko, Li, Lo and Wu) to 15 letters (Phoonphiphutana and Schwartzenhauer). Others are interested in whether the Johnsons out-vote the Smiths.

The writer is interested in the statistics of geographical distribution, having called attention in his secretarial reports to the unique concentration of members in the Sacramento area. We find California out in front for the first time. In 4.9 years the shift in the five leading states was as follows:

State	Feb. 2, 1942	Dec. 31, 1946
California	2,106	3,160
New York	2,458	2,706
Pennsylvania	1,147	1,040
Illinois	828	1,038
Texas	832	1,001

During this time the Society grew by 24 percent, California grew 50 percent, Illinois 25 percent, Texas 20 percent, New York 10 percent and Pennsylvania lost ground. This suggested a check on the centroid of membership in the states, which showed:

Centroid on	Latitude	Longitude
Feb. 2, 1942	N 39°02′	W 89°54′
Dec. 31, 1946	N 39°00′	W 91°30′

Reduced to more familiar landmarks, that means that the center of the Society moved from Illinois into Missouri, crossing the Mississippi, and headed for California. The nearest city to the centroid is Mexico, Mo., where Director Panhorst outgrew his triangular trousers.

Getting back to concentrations, we used the 1940 census (conceded to be obsolete) to compute the density of Society membership per million inhabitants, finding for the leading states:

State	Density
California	457
Nevada	336
Colorado	334
Washington	332
Oregon	299
Arizona	279

These densities are 2 to 3 times the national average of 151 and the California density is 10 times that of the 45 in North Carolina. The following breakdown of Districts 11 and 13 by Sections shows that Sacramento Section is the nucleus of this concentration in the Western States.

Section	Assigned Members	Population in Millions	Density
Sacramento	358	0.541	660
San Francisco	1,196	2.468	484
Intermountain	219	0.974	226
District 13	1,773	3.983	445
Los Angeles	1,364	3.625	376
San Diego	112	0.349	332
Arizona	139	0.499	279
District 11	1,615	4.473	362

While we are predicting, with California license, we foresee the day when Society Headquarters will be moved to California, leaving a small branch office in New York.

Competition for Mead Prizes Is Announced

Competition for the award of the Daniel W. Mead Prizes next year has been initiated by the announcement of the subject for discussion by the Society's Committee on Professional Conduct. The subject chosen, covering both the Junior Prize and the Student Prize, is now announced by the Committee as follows:

"Is it ethical for a professional engineer employer to utilize the services of a non-technically trained employee so that the latter is led to believe that, through training obtained in performing such services, he may attain a professional rating?"

The present subject as stated here covers the competition that will be concluded next summer (July 1, 1948). Competition papers—limited to 2,000 words—shall be submitted for exclusive reference to the Society and presented before some Society group. A full statement of conditions for awarding these prizes is given in the current Yearbook, pages 126, 127. Contestants are advised to read these rules.

The purpose of this early announcement is to provide ample time for complying with the simple requirements set up. An interesting Society development in the postwar period has been the renewal of activities by Juniors and students. The Mead Prizes should stimulate helpful professional discussion, and at the same time lend material financial attraction.

Duluth Convention Changes in Constitutional Amendments

THERE HAVE BEEN indications of some misunderstanding regarding the wording of the two constitutional amendments now being considered, as that wording was changed from the floor at the Summer Convention Meeting at Duluth. Some uninformed persons have stated that a handful of members at the Convention, by restrictive amendments to the printed form, virtually emasculated the voting rights for Juniors contrary to the intent of the petitions signed. The "Notes" below recite the facts and should dispel any misunderstanding of the amendment regarding Juniors as it will go to ballot.

NOTES

NOTES relative to changes in proposed amendments to ASCE Constitution as made from the floor at the Annual Summer Convention of the Society in Duluth, Minn., July 16, 1947.

REFERENCE is to the printed copy of proposed amendments as circulated under date of June 21, 1947.

Page 3, line 3. The words "and Juniors" were stricken from the third line from top of page 3. This is an innocuous change. The Convention also might have stricken the word "Corporate" from the same line. Announcements required by the sentence in question would be made in CIVIL ENGINEERING in any event and thereby made known to members of all grades.

Page 4, lines 5 and 7. The words "and Juniors" were stricken in two instances from Section 7 of Article VII. So far as recollection by the oldest inhabitant of the New York office goes, the provisions of Section 7, Article VII, of the Constitution never have been used. They permit a nomination for Director, Vice-President or President to be made by petition of not less than 25 signers either before or after the regular nominating procedure of the Society has taken place. The Summer Convention appeared to believe that the privilege of "write-in" nominations by petition should be confined to Corporate Members for the present. This restriction does not affect in any way, should the amendment pass, the right of a Junior to vote for nominees for office or to vote for their election.

Page 4, line 7 of Article VIII. There are approximately 15,000 Corporate Members in ASCE. The Constitution provides that there be "two general meetings of the Society each year." The Board of Direction and the Convention meeting indicated that thirty Corporate Members for a quorum, as provided in the Constitution, already is too small a number for a Society as large as ours and that this number should be raised when general revision of the Constitution is considered. There is no reason to expect that Juniors would be excluded from the new quorum count in drafting such constitutional change, especially if Juniors have the vote at that time.

The Convention held to the present provision requiring that there be at least thirty Corporate Members present to constitute a quorum at the general meetings of the Society. However, if the amendment to enfranchise Juniors passes, Juniors present will have the same rights as Corporate Members in bringing matters before such meetings and in voting on them.

Page 1, line 3 from bottom of page, Section 3, Article VI. Here the word "seventeen" was changed to "twelve." The change affects some 600 Juniors in the New York Metropolitan area only, and puts the annual dues of these young members on a parity with Juniors living elsewhere.

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Southern Idaho Section of ASCE Is Formed

ON PETITION OF ASCE members of the Intermountain and Spokane Local Sections living in southern Idaho, the Board of Direction at the Duluth Convention approved the formation of a Southern Idaho Section of the Society. The petitioners believe that an active organization closer than the nearest Sections (Intermountain and Spokane) will give local members an incentive for more active participation in Society affairs than is obtainable from only occasional attendance at distant meetings.

John Congdon, of Boise, Idaho, headed the committee that has been active in forming the new Section, and served as chairman of the organization meeting held in Boise on June 21. Officers of the new Local Section are: Myron Swendsen, president; C. C. Hallvick, first vice-president; R. F. Hamilton, second vice-president; Linne F. Erickson, secretary; and Wayne I. Travis, treasurer.

NEWS OF LOCAL SECTIONS

Coming Events

Cincinnati—Meeting at the Herman Schneider Foundation, Cincinnati, October 1, at 6 p.m. A. B. Backherms will speak on the Cincinnati sewage-disposal project.

Connecticut—Dinner meeting in New Haven, Conn., October 1, at 6:30 p.m Fred Lavis, M. ASCE, will speak on "American Engineers and Engineering in South America."

Georgia—Regular luncheon meeting at Davison's Tea Room, Atlanta, September 2, at 12:30 p.m.

Kansas City—Juniors of the Section will meet in the Geology and Physics Bldg., University of Kansas City, September 8, at 7:45 p.m. A discussion on present practices in soil mechanics will be led by K. V. Taylor, head of the soil mechanics design section of the U.S. Engineer Office at Kansas City.

Louisiana—Regular meeting in the St. Charles Hotel, New Orleans, September 29, at 8 p.m.

Sacramento—Regular luncheon meetings at the Elks Club every Tuesday at 12 noon. Except on spceial occasions, visitors are welcome.

Tennessee Valley—Meeting of the Chattanooga Sub-Section at the Hotel Patten, Chattanooga, September 19.

Texas—Luncheon meeting of the Dallas Branch at the Adolphus Hotel, Dallas, October 6, at 12:15 p.m.; luncheon meeting of the Fort Worth Branch at the Blackstone Hotel, Fort Worth, September 8, at 12:15 p.m.

Wisconsin—Dinner meeting in Engineers Society of Milwaukee Bldg., Milwaukee, September 18, at 6:30 p.m. President E. M. Hastings will be the principal speaker.

Scheduled ASCE Meetings

FALL MEETING

Jacksonville, Fla., October 15–17
(Board of Direction meets
October 13–14)

ANNUAL MEETING

New York, N.Y., January 21–23
(Board of Direction meets
January 19–20)

INSPECTION TRIP TO open-pit iron mines at Hibbing, Minn., was feature of Duluth Convention. Making trip are (left to right) Wayne A. Clark, chairman of Program Committee; Gordon H. Butler, general chairman of Convention; and Ralph Palmer, member of Transportation Committee.

AMONG VISITORS TO Duluth Convention are ASCE Director and Mrs. Harry F. Thomson (center), shown here with Gordon H. Butler, general chairman of Convention (left) and George W. Deibler, chairman of Transportation Committee.

DULUTH CONVENTION GUESTS include (left to right) E. L. Chandler, Washington, D.C., Eastern Representative of ASCE; A. W. Harrington, Albany, N.Y., ASCE Vice-President; and Sterling S. Green, Los Angeles, Calif., member of Society's Committee on Employment Conditions.

Recent Activities

FLORIDA

Revision of the Jacksonville, Fla., building code to permit the use of prefabricated light-gage metal in buildings, so long as designs conform to the American Institute of Steel Construction code, was favored by the majority of Section members attending the July dinner meeting. In a symposium on the subject, E. D. Miller, district representative for the Great Lakes Steel Corp., stated there is a definite place for prefabricated structures, citing as proof the successful use of such buildings as churches, warehouses, and garages. This type of construction is not intended to take the place of major structural steel buildings, he pointed out. In opposition to Mr. Miller's point of view was Edgar A. Poppell, Jacksonville consultant, who expressed the opinion that such materials are unsuited for use in the South, because of the corrosive action of the atmosphere. It was also his contention that the type of structure resulting from the use of prefabricated materials, would be unsightly and unsafe. After considerable round-table discussion, a recommendation was drafted for the use of the Jacksonville Building Code Committee in its present work of formulating a new code.

TEXAS

Public health in Texas was discussed by V. M. Ehlers, director of the bureau of sanitary engineering in the Texas State Department of Health, at a recent joint luncheon meeting of the Forth Worth Branch of the Section and the Fort Worth chapter of the Texas Society of Professional Engineers. During the meeting, the Branch elected the following new officers: E. L. Ferguson, president; J. R. Hendrick, vice-president; and John J. Burgess, secretary-treasurer.

PITTSBURGH

Conemaugh Dam, a huge government flood-control project on the Conemaugh River near Pittsburgh, was the objective of a recent tour sponsored by the Section. Of special interest to the group, which included Mayor Lawrence of Pittsburgh, was the relocation of 16 miles of Pennsylvania Railroad involved in the project. According to R. H. Crew, assistant chief engineer of the railroad, relocation of the right-of-way will constitute one of the biggest jobs of railroad building in years. In addition to excavation of thousands of cubic yards of earth, the project will involve building six bridges and a 2,660-ft tunnel, near Saltsburg. The relocating project, to be finished next year, will cost $7,254,000. Cost of the entire dam project is estimated at $34,000,000. Speakers, in addition to Mr. Crew, included Park H. Martin, president of the Pittsburgh Section, and D. D. Rait, resident engineer on the project.

TACOMA

Planning and financing of the South Tacoma trunk sewer was described by Burwell Bantz, city engineer of Tacoma, at a recent dinner meeting. Mr. Bantz then introduced the two principal designers, R. G. Anderson and L. E. Fox, who covered the project in greater detail. A discussion on the subject of increasing Society dues was led by Section President Charles E. Andrew.

TENNESSEE VALLEY

An engineering survey of bomb damage to Nagasaki—given by Walter C. Youngs, Jr., deputy chief of the production branch of the Atomic Energy Commission—featured the August 18 meeting of the Oak Ridge Sub-Section. Mr. Youngs was one of two engineers assigned to the 15-member Manhattan District Atomic Survey Group sent to Japan in September 1945 to prepare a survey of and report on bomb damage. He showed a sound film, "A Tale of Two Cities," a digest for public release of an official War Department picture, which was made for the Senate Committee on Atomic Control by Signal Corps photographers who accompanied the Survey group to Japan.

SACRAMENTO

A projected deep-water ship channel to Sacramento's front door was described by Will G. Stone, port director of the Sacramento-Yolo Port District Commission, at one of the July luncheon meetings. Mr. Stone emphasized the saving in transportation rates that will result from such a ship channel, which will serve parts of Oregon and Nevada as well as 20 counties north and east of Sacramento. Under the port district plan, Lake Washington on the Yolo County side of the Sacramento River is to be used for a turning basin and for industrial development. Speakers at the other luncheon meetings included Karl Kohler, regional engineer for the U.S. Soil Conservation Service, who discussed the operation of the Service; F. M. Carter, traffic engineer for the State of California, who gave a demonstration of traffic control by means of an automatic dispatcher and an intersection model; Claire Holdredge, district geologist for the Army Corps of Engineers, whose subject was "Diamond Mining in the Belgian Congo"; and H. B. Walker, professor of agricultural engineering at the University of California who discussed the use of machinery in modern farming.

NEWS BRIEFS

ABOUT ENGINEERS AND ENGINEERING

Interstate Highway Network of 37,681 Miles Gets FWA and PRA Approval

FORTY-TWO STATE CAPITALS and 182 of the nation's largest cities will be connected by the integrated highway system that received final approval on August 2, after three years of intensive work by national agencies and the state highway departments. The interstate network was ratified by Maj. Gen. Philip B. Fleming, M. ASCE, FWA Administrator, on recommendation of Thomas H. MacDonald, Hon. M. ASCE, Commissioner of the Public Roads Administration.

Routes comprising the approved system total 37,681 miles, and an additional 2,319 miles of urban circumferential and distributing routes will be designated at a later date. Depressed or elevated expressways are projected in many cities to permit through urban travel at 35 to 45 miles an hour.

For starting work on the approved mileage the states will be able to draw on the federal aid provided under the $3,000,000,000 postwar program authorized by Congress in the Federal-Aid Highway Act of 1944, which allots $500,000,000 a year to assist the states (see CIVIL ENGINEERING for August, page 68). In most states half of the construction costs and up to one-third of the right-of-way costs are to be paid by the federal government.

Routes in the approved system conform in general to those recommended in a report submitted to President Roosevelt in 1944 by the National Interregional Highway Committee under the chairmanship of Commissioner MacDonald of the PRA of the FWA. In 1945 the highway departments of all the states sent recommendations for routes, and since that time differences regarding alternate routes and connections at state boundaries have been cleared up. Actually the final system as now approved embodies few changes in the recommendations which were made by the state highway departments.

The principal routes of the present federal-aid system are followed—with exceptions, however, where relocations are required to meet standards of width, grade, alignment, and control of access.

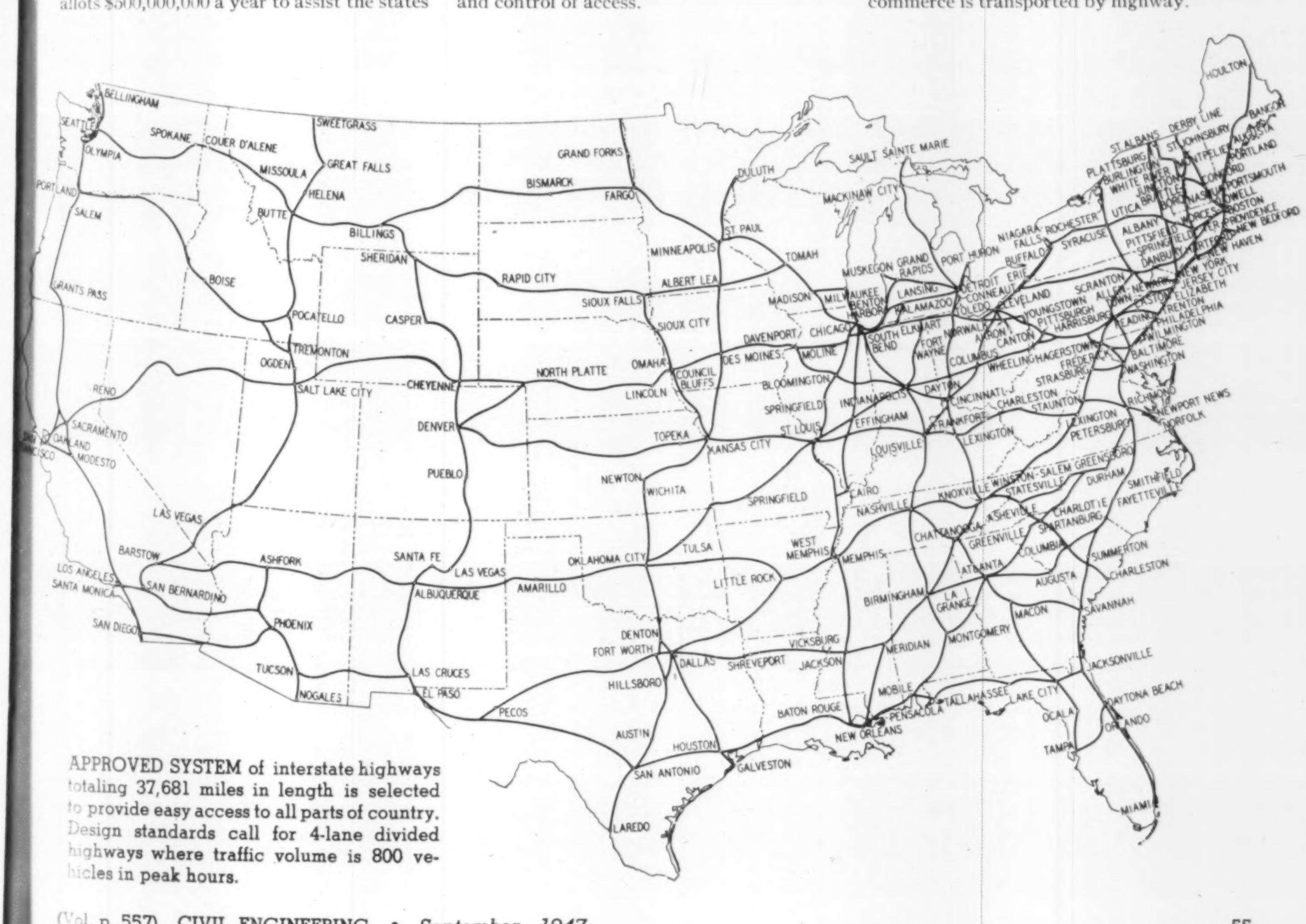
Work has already been started on sections of the approved network for which plans were completed before the war ended. Commissioner MacDonald has emphasized that the development of the integrated network, to meet the standards recommended by the Public Roads Administration and the Association of State Highway Officials, is a long-range program to be carried out over a period of years.

◆

Truck Transportation Hits All-Time High in Volume

TRUCK TRANSPORTATION has reached a new high in motor history, according to Charles M. Upham, M. ASCE, engineer-director of the American Road Builders' Association. Last year some 5,726,000 trucks were registered in the United States, as compared to 4,859,244 registrations in 1941, the prewar motor peak.

For every seven families in the nation one truck is kept busy transporting food, clothing, building materials and other goods, Mr. Upham said. At some stage almost every finished product used in industry and commerce is transported by highway.


BELLINGHAM
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PORTLAND
SALEM
BILLINGS
SHERIDAN
BOISE
GRANTS PASS
POCATELLO
CASPER
TREMONTON
OGDEN
SALT LAKE CITY
CHEYENNE
RENO
SACRAMENTO
OAKLAND
MODESTO
DENVER
PUEBLO
LAS VEGAS
BARSTOW
LOS ANGELES
SANTA MONICA
SAN BERNARDINO
SAN DIEGO
ASHFORK
PHOENIX
TUCSON
NOGALES
SANTA FE
LAS VEGAS
ALBUQUERQUE
AMARILLO
LAS CRUCES
EL PASO
PECOS
GRAND FORKS
BISMARCK
FARGO
RAPID CITY
MINNEAPOLIS
ALBERT LEA
SIOUX FALLS
SIOUX CITY
NORTH PLATTE
OMAHA
COUNCIL BLUFFS
LINCOLN
TOPEKA
KANSAS CITY
NEWTON
WICHITA
TULSA
OKLAHOMA CITY
DENTON
FORT WORTH
DALLAS
HILLSBORO
AUSTIN
HOUSTON
SAN ANTONIO
GALVESTON
LAREDO
DULUTH
ST PAUL
TOMAH
MADISON
DAVENPORT
DES MOINES
MOLINE
BLOOMINGTON
SPRINGFIELD
ST LOUIS
SPRINGFIELD
LITTLE ROCK
WEST MEMPHIS
SHREVEPORT
VICKSBURG
JACKSON
BATON ROUGE
NEW ORLEANS
SAULT SAINTE MARIE
MACKINAW CITY
MUSKEGON
GRAND RAPIDS
PORT HURON
MILWAUKEE
BENTON HARBOR
LANSING
KALAMAZOO
CHICAGO
SOUTH BEND
ELKHART
FORT WAYNE
DETROIT
TOLEDO
INDIANAPOLIS
EFFINGHAM
LOUISVILLE
CAIRO
NASHVILLE
MEMPHIS
DAYTON
CINCINNATI
FRANKFORT
LEXINGTON
CHATTANOOGA
BIRMINGHAM
ATLANTA
LA GRANGE
MERIDIAN
MONTGOMERY
MOBILE
PENSACOLA
TALLAHASSEE
LAKE CITY
OCALA
TAMPA
ORLANDO
DAYTONA BEACH
JACKSONVILLE
MIAMI
MACON
SAVANNAH
AUGUSTA
CHARLESTON
SUMMERTON
COLUMBIA
GREENVILLE
SPARTANBURG
ASHEVILLE
CHARLOTTE
KNOXVILLE
WINSTON-SALEM
STATESVILLE
GREENSBORO
DURHAM
SMITHFIELD
FAYETTEVILLE
NIAGARA FALLS
BUFFALO
ROCHESTER
SYRACUSE
ERIE
CONNEAUT
CLEVELAND
NORWALK
AKRON
CANTON
COLUMBUS
YOUNGSTOWN
PITTSBURGH
WHEELING
CHARLESTON
STAUNTON
STRASBURG
HAGERSTOWN
FREDERICK
HARRISBURG
SCRANTON
ALLENTOWN
READING
EASTON
LEXINGTON
PETERSBURG
RICHMOND
NEWPORT NEWS
NORFOLK
WASHINGTON
BALTIMORE
WILMINGTON
PHILADELPHIA
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ELIZABETH
NEWARK
JERSEY CITY
NEW YORK
NEW HAVEN
DANBURY
HARTFORD
SPRINGFIELD
PITTSFIELD
ALBANY
UTICA
PLATTSBURG
ST. ALBANS
BURLINGTON
WHITE RIVER JUNCTION
BRATTLEBORO
DERBY LINE
ST. JOHNSBURY
MONTPELIER
CONCORD
NASHUA
WORCESTER
PROVIDENCE
NEW BEDFORD
BOSTON
LOWELL
PORTSMOUTH
PORTLAND
AUGUSTA
BANGOR
HOULTON

APPROVED SYSTEM of interstate highways totaling 37,681 miles in length is selected to provide easy access to all parts of country. Design standards call for 4-lane divided highways where traffic volume is 800 vehicles in peak hours.

One out of every eleven pay checks issued in the United States goes to a worker in the truck transport industry. The 4,750,000 commercial truck drivers make up the nation's second largest occupational group, a recent report from the Automobile Manufacturers Association shows. They are exceeded in number only by farmers. The industry also provides employment for 715,000 additional workers in production of motor trucks and parts, sales and servicing, gasoline and lubricants and raw materials.

Quick and economical truck transportation, which benefits shipper and consumer alike, depends upon an efficient highway system, Mr. Upham added. Outmoded streets slow down delivery and add to its costs. A recent study in Pittsburgh shows that each minute of delay to the average truck on city streets costs 2.3 cents. Since 10,000 trucks enter the downtown section daily, a saving of 10 percent in time for each truck would amount to a total of $4,140,000 a year.

◆

Continued Strength in Construction Activity Is Forecast

Construction activity has shown considerable strength during the first half of 1947, although below the levels anticipated at the beginning of the year. There is every indication that this strength will be maintained during the next six months and that the current level of activity may even increase slightly, according to the July *Industry Report* of the Department of Commerce.

In dollar terms, the 1947 new construction total is expected to reach 12.2 billion dollars. If achieved, this dollar volume would be the highest for any year except for the peak of war construction in 1942. In physical terms, however, it means a 1947 total only slightly above that for 1946 and only some 10 percent above 1939, the last "normal" prewar year (see Civil Engineering for July 1947, page 35).

Private residential building was markedly higher than last year, with a total of 1,883 million dollars for the first six months of 1947, more than 63 percent above that for the corresponding period of 1946. Private non-residential building underwent a general but slight decline, which is believed to be partially at least the result of governmental controls.

Public construction during the first half of 1947 experienced a larger increase in comparison with the first half of 1946 than did either private construction or construction of all types. The total of 1,241 million dollars is 76 percent higher than the total of 705 million in the first six months of 1946. The largest single component in public construction is highway construction, which accounted for one-third of all public construction in the first half of this year. The total of 419 million dollars was double that for the same period of 1946.

For most major construction materials the rate of current output is favorable and somewhat ahead of immediate demand. However a few critical items continue to occasion some delays in construction work because of uneven distribution.

Costs of construction appear to be leveling off at about 90 percent above those of the prewar period. There seems to be little prospect of substantial decline during the remainder of 1947. (See Civil Engineering for August 1947, page 68.)

◆

High-Pressure Pipe Installation Stores 1,250,000 Cu Ft of Natural Gas

An underground pipe for storing 1,250,000 cu ft of natural gas at a pressure of 2,240 psi has been placed in service by the Public Service Co. of Illinois near Kankakee. The pilot installation, which uses pressure vessels fabricated from lengths of seamless steel pipe, is intended to supplement low-pressure distribution in the Kankakee area and provide an emergency supply for high-pressure customers in the area normally supplied from the high-pressure distribution feeder main at Mattison, Ill. Another unit capable of storing 40,000,000 cu ft is now under construction at Evanston.

The seamless pipe, of alloy steel having a yield point in excess of 80,000 psi, is furnished in 40-ft lengths, 24-in. O.D. and 0.512-in. wall thickness. Each end is hot swedged to contour in five stages, using a 2,000-lb steam hammer. One end is cut to length and rough bored and the cylinder is normalized to produce the desired grain structure in the steel. After the cylinder has been shot blasted and both necks finished to the required size in a special horizontal boring mill, the cylinders are subjected to a 2,800-psi hydrostatic test to make sure that the permanent set at this pressure does not exceed prescribed limitations.

Fifty lengths of pipe, fabricated into storage cylinders arranged in five lines of eight units, four on each side of a manifold, were used in the Kankakee installation and 160 similar units will be required at Evanston. Each unit, on an average, has an internal volume of 109.66 cu ft and is capable of storing approximately 30,000 cu ft of natural gas. Because of the compressibility factor of natural gas, which shows maximum deviation from the laws of perfect gases near the pressure of 2,240 psi, it is possible to store approximately 230 cu ft of natural gas in 1 cu ft of space at that pressure and 40-deg temperature while only approximately 160 cu ft of a perfect gas could be stored under the same conditions.

Large-Scale Home Building Accelerates Paving Program

Construction of new streets in city and suburban areas will make up at least 30 percent of all road-building expenditures during the next five years, the Paving Brick Institute estimates. Because of the unprecedented demand for new homes and as a result of the increasing trend toward developing outlying areas for residential purposes, expenditures for streets probably will exceed all past records for the next five years, according to a spokesman for the Institute.

The volume of municipal paving declined sharply during the war, when residential construction was restricted largely to war housing, and in 1943 fell to the lowest point in 30 years, amounting to less than $60,000,000 for the entire country. But by 1948 expenditures for municipal paving are expected to exceed the record of $485,000,000 set in 1927, when home building reached its all-time peak.

Repair and maintenance of city streets also will probably reach new high levels this year or next. Funds spent for this purpose during the war were insufficient to meet the need and much of the money went for pavements that would have been replaced entirely under normal conditions.

◆

Land Along Alaska Highway Is Opened for Settlement

Settlers are now permitted to take up land along 338 miles of the Alaska Highway, according to a recent announcement of the Interior Department. Initial settlements will be allowed only at the most favorable points, the order stated, and war veterans will be given a 90-day preference in consideration of applications.

At the same time the department pointed out that settlements along the highway will be commercial or recreational rather than agricultural since "high elevations and adverse soil conditions make the raising of money crops on the land doubtful." According to the statement, the department has in mind mainly the setting up of houses, cabins, camps, taverns, gasoline stations, and health and recreational facilities to serve tourists and attract new enterprises to Alaska. Surveys and land examinations of the area already have been started.

◆

South Africans Study Highway Safety Measures

Alarmed by the high traffic death rate in the Union of South Africa since the war, that country's ministry of transport recently sent a road safety mission to the United States to study highway safety measures adopted here.

Members of the mission visited Washington; New York; Hartford and New Haven, Conn.; Chicago; Milwaukee; Evanston, Ill.; Detroit; and San Francisco before making a tour of Canada. Previously they had studied highway safety precautions in France, Switzerland, Denmark, Norway, Sweden, and England.

Lack of Highway Building Increases Maintenance Costs

Rising maintenance costs for the nation's 3,250,000 miles of roads and streets can be expected if the highway construction program lags, H. K. Bishop, manager of the County Highway Officials' Division of the American Road Builders' Association, told a Washington highway conference recently. A report to the association from state highway departments shows that lack of new highway building already has resulted in increased maintenance costs in a total of 32 states.

Unless a constant program of new improvement is carried on, maintenance costs rise to exorbitant proportions, the amount of excess cost depending on age and obsolescence of the roads, Mr. Bishop said. With the 40,000,000 motor vehicles predicted for our highways by 1950, new construction is needed to prevent an increase in traffic congestion and accidents. Patched-up roads cannot meet the requirements of rapidly increasing traffic, he declared.

◆

Federal Aid Act Grants $225 Million for Hospitals

Hospital and health facilities totaling $225,000,000 can be constructed during the fiscal year of 1948 under the appropriations act recently signed by the President, according to Thomas Parran, Surgeon General of the U.S. Public Health Service. The act obligates the federal government to pay up to $75,000,000 as its share of approved hospital construction.

Although no federal funds were directly appropriated for this purpose, the act sets up a contractual obligation for Congress to grant the funds, a procedure patterned after the program of federal aid to highway construction. Under this arrangement states need not delay their hospital construction plans since they have the assurance that any construction project approved by the Surgeon General creates a contractual obligation for the federal government to meet a third of the cost. Contractual obligations, though not formal contracts, are treated as if they were contracts and always have been honored by Congress in the past.

This legislation implements the construction phase of the Hospital Survey and Construction Act passed by Congress last year, authorizing the appropriation of $3,000,000 for survey and planning and $75,000,000 for construction annually for five years. Last year's appropriation of $2,250,000 was made to assist the states in surveying existing hospital facilities. The $75,000,000 just appropriated is the first money to be made available for construction. Funds may be used for health centers, laboratories, clinics and other medical facilities as well as for hospitals.

All states and territories, including the District of Columbia, are conducting inventories of their hospitals and health facilities. Construction plans for Indiana, Mississippi and North Carolina already have been approved, and more than half of the states are expected to submit their plans by this coming fall.

Diorama of Philadelphia Demonstrates Value of City Planning

An elaborate $300,000 city planning exhibition which opens in Philadelphia September 8 will demonstrate the real meaning of city planning to taxpayers. Exhibits to occupy more than an acre of space at the Gimbel store will show the city's past, present and future. Specific public improvements, proposed, scheduled and under way, and their cost in dollars and cents to the individual taxpayer will be explained. Embodied in the exhibition will be changes and improvements recommended by the City Planning Commission, projects scheduled for 1947–1952 at a total estimated cost of $302,400,000.

Highlight of the show will be a three-dimensional model of the downtown area, covering 440 sq ft, with all buildings, streets and contours in correct scale. Sections of the model will rotate automatically to show how Philadelphia could look in 30 years, after completion of the twelve major improvements planned.

Officially sponsored by the city of Philadelphia, the exhibition is under the direction of the City Planning Exhibition, a nonprofit organization of city officials and nonpaid civic leaders with Mayor Bernard Samuel as honorary president and Benjamin Rush, Jr., as president. A third of the cost was paid by the city, and the remainder was contributed by civic-minded individuals and mercantile, financial and industrial organizations. After its close October 15, the exhibit will be moved to a permanent location.

THREE-DIMENSIONAL diorama of metropolitan Philadelphia is most elaborate feature of Better-Philadelphia Exhibition to be shown from September 8 to October 15 on fifth floor of Gimbel Store. Diorama, 22 ft deep and 28 ft wide, depicts Philadelphia as it will look when vast improvements planned for city are realized. Buildings diminish in size as eye sweeps to horizon, where other cities serve to orient observer.

◆

University of Mississippi's New Curriculum Stresses Construction, Not Design

Emphasis will be shifted from design to construction in the new civil engineering program to be offered by the University of Mississippi next September. Twelve leading engineers will serve as special lecturers in the 1947–1948 session.

Students taking advantage of the new curriculum will have a choice of either construction or municipal work. The construction option features construction equipment, methods, estimating, earthwork and foundations. Under the municipal option will be offered city planning, public utilities and municipal government. Both include cost accounting, personnel management and labor problems.

Special lecturers on construction engineering will be C. C. Cappel, M. ASCE, partner in the W. Horace Williams Co., New Orleans; B. J. Fry, M. ASCE, vice-president of the E. J. Albrecht Co., Chicago; R. A. Harris, chief engineer with the Mississippi State Highway Department, Jackson; Dan Heiple, field engineer with R. G. Le Tourneau, Inc., Peoria, Ill.; E. L. Mosebaugh, district representative of the Jaeger Machine Co., Birmingham, Ala.; Kenneth F. Park, M. ASCE, consulting engineer for the Caterpillar Tractor Co., Peoria; F. V. Ragsdale, M. ASCE, president of the F. B. Ragsdale Co., Memphis, Tenn.; V. L. Snow, head of the sales development department of the Euclid Road Machinery Co., Cleveland, Ohio; Nello L. Teer, president of the Nello L. Teer Co., Durham, N. C.; Hugh Worley, Jr., Assoc. M. ASCE, partner in the W. H. Patterson Co., Baton Rouge; and B. F. Worsham, Jr., partner in the Worsham Brothers Construction Co., of Corinth, Miss.

F. H. Hall, city engineer of Greenville, Miss., will be special lecturer on municipal engineering. A. B. Hargis and Dr. F. H. Kellogg, M. ASCE, professors of civil engineering at the university, with a total of 50 years' construction experience between them, will direct the activities of the new courses.

Contract Awards to Be Pushed on Missouri Development Plan

Plans to speed up the Corps of Engineers' construction work on the Missouri River flood control and development program were announced recently by Brig. Gen. Lewis A. Pick, Missouri River Division Engineer, following a meeting with his district engineers.

"It is our expectation," said General Pick, "that a large number of new contracts for work on important river control projects can be advertised between now and December 1, 1947. It is planned to obligate all the funds authorized by the Congress, prior to July 1, 1948, which is the close of the government's fiscal year."

Describing his meeting with the district engineers as a "working meeting," General Pick said engineering problems were outlined and that each district engineer would be prepared to award contracts by competitive bidding on projects within his district for which funds were provided by the appropriation bill signed by the President on July 31. The bill provided about $60,000,000 for flood control projects of the authorized Pick-Sloan plan, and an additional $6,750,000 of Rivers and Harbors funds for work on the 9-ft Missouri River navigation channel up to Sioux City, Iowa.

General Pick said that all possible speed, consistent with efficiency and sound engineering practice, would be exercised in getting additional contracts under way at such large projects as the Garrison Dam in North Dakota; Fort Randall Dam in South Dakota; Harlan County Dam on the Republican River, Nebraska; Cherry Creek Dam near Denver; Kanopolis Dam on the Smoky Hill River in Kansas; and the important flood control works at the Kansas Citys, Omaha and Council Bluffs.

Attending the meeting with General Pick were Col. W. E. Potter, M. ASCE, Kansas City District Engineer; Lt. Col. Craig Smyser, Denver District Engineer; Lt. Col. Delbert B. Freeman, M. ASCE, Omaha District Engineer; and Lt. Col. Noel H. Ellis, executive officer, Garrison District.

◆

First Six Months' Construction Volume in East Is Below 1946 Level

Construction volume for the first half of 1947 was 11 percent below that reported for the corresponding six months of last year in the 37 states east of the Rocky Mountains, F. W. Dodge Corp., a fact-finding organization for the building industry, reports on the basis of figures on contracts awarded.

Gains in the first two months of this year were offset by a decline beginning in March. The sharpest drop was in nonresidential contracts, down 23 percent by June 30. Residential building volume fell off 10 percent, while public works and utilities construction showed a 9 percent gain over the first six months of last year.

Contract valuations for the first half of 1947 totaled $3,492,645,000 as against $3,937,736,000 reported in these 37 states for the first six months of 1946. Residential volume was $1,468,902,000 as compared with $1,633,473,000 in the first six months of last year. Residential contracts this year called for the building of 187,019 dwelling units against 234,315 in the corresponding period of last year. Nonresidential building contracts declined from $1,517,262,000 in the first six months of 1946 to $1,165,631,000 in the first half of the current year.

While declines were general in most parts of the country, they varied from an overall drop of 32 percent in the upstate New York and northern and eastern Ohio areas to gains of 70 percent in the states of Louisiana and Mississippi combined. Publicly owned projects figured more prominently this year than last year. Contracts for projects classified as publicly owned represented 30 percent of this first half year's total as compared to 20 percent in the first half of 1946.

◆

August Construction Bid Calls Announced by Bureau of Reclamation

Construction projects scheduled to get under way in Western states soon are listed in the Bureau of Reclamation's *Advance Construction Bulletin* for August. Announcements of August bid calls are published for information only and are subject to revision, the *Bulletin* states. For further information on these projects, address the Chief Engineer, Bureau of Reclamation, Denver 2, Colo., or the nearest regional director.

STEEL PENSTOCKS

Davis Dam Project, Arizona-Nevada

Location: Davis Dam and Powerplant, 30 miles west of Kingman, Ariz.

Work: Construction of five 22-ft-dia, welded, plate steel penstocks.

Steel plate required	3,000,000 lb

Time Allowed for Completion: 500 days.

LATERALS

Shoshone Project, Wyoming

Location: Northwestern Wyoming

Work: Construction of 40 miles of laterals and sublaterals; second unit of Ralston laterals.

Excavation	300,000 cu yd
Furnishing and placing reinforcement steel	153,000 lb
Concrete	2,100 cu yd
Furnishing and installing 18-in. to 48-in. pipe	3,000 ft

Time Allowed for Completion: 400 days.

CABLEWAY AND GAGING STATION

Davis Dam Project, Arizona-Nevada

Location: Davis Dam, Colorado River, 30 miles west of Kingman, Ariz.

Work: Erection and installation of cableway (approximate length: 1,000 ft), and gaging station.

Time Allowed for Completion: 150 days.

SPILLWAY GATES, HOISTS, BRIDGE

W. C. Austin (Altus) Project, Oklahoma

Location: Altus Dam, near Altus, Okla.

Work: Installation of spillway gates, hoists, and bridge on Altus Dam.

Installing pipe handrail	11,000 lb
Installing radial gates	154,000 lb
Installing hoists	37,000 lb
Furnishing and placing reinforcement bars	6,300 lb
Erecting structural steel in bridge	36,000 lb

Time Allowed for Completion: 180 days.

WEIR

Cambridge Diversion Dam, Frenchman-Cambridge Unit, Missouri Basin Project

Location: Near Cambridge, Nebr.

Work: Construction of concrete weir for diversion of Republican River into Cambridge Canal.

Excavation	1,800 cu yd
Reinforcement steel	253,000 lb
Installing radial gates and hoists	43,200 lb
Concrete	4,100 cu yd
Riprap	800 cu yd

Time Allowed for Completion: 450 days.

◆

Topaz Increases Strength of Fired Refractory Concrete

Addition of finely ground topaz increases the fired strength of refractory concrete at temperatures of 1,600 deg F or above, recent research by the Lumnite Division of the Universal-Atlas Cement Co. indicates. Higher strengths provide greater load-bearing capacity and stuctural stability for walls, slabs and arches. The admixture yields a denser, less friable concrete for hearths and floors of many types of kilns and furnaces where temperatures are between 1,600 and 2,200 deg F.

Investigation of a large number of natural minerals and synthetic materials developed that finely ground topaz gives satisfactory results and is economically practicable. Refractory mixtures containing topaz fired to 1,600 deg F or above form a dense, hard concrete with materially increased strength. At 1,600 deg F it is necessary to add topaz in an amount equivalent to 75 percent by weight of cement to cause any increase in compressive strength. At 2,000 deg F, however, 25 percent topaz by weight of cement is sufficient to slightly increase the compressive strength; 100 percent topaz increases the compressive strength over 400 percent. Silica flour or potter's flint may be substituted for half the topaz admixture up to 2,200 deg F to reduce the total cost.

Rising Construction Costs Hamper Veterans' Hospital Program

CONSTRUCTION COSTS have outdistanced even the generous Congressional appropriations made available to the Veterans Administration for its $772,702,845 hospital construction program, according to its administrator, General Omar N. Bradley. He states, "Either we must modify the desirable but non-essential features of a substantial number of structures on the drawing boards, or we may require as much as $100,000,000 in additional funds."

In the face of high construction costs, General Bradley says that the Veterans Administration is confronted with the choice of either obligating the American people for millions of dollars in excess of the present authorization or of devising some way to go ahead within the limits of present funds.

Examination of the preliminary layouts for a number of hospitals under design has shown that they cannot be built at today's prices with the funds allotted to them a year ago. A hospital that cost 85 cents per cu ft in 1945 would have cost $1.25 per cu ft in 1946, and at today's prices would cost the taxpayer about $1.80 for the same cu ft.

General Bradley states further that "Despite the need for restudy of a substantial number of hospital plans, the Veterans Administration will go ahead on the eight hospitals already under partial or full construction contracts. These structures, when completed, will provide 4,000 more beds for general medical and surgical patients, and 1,984 more beds for veterans suffering from mental disorders. They are to be located at the following places:

Peekskill, N.Y.	1,984 beds
Providence, R.I.	400 beds
Minot, N.Dak.	150 beds
Sioux Falls, S.Dak.	300 beds
Grand Junction, Colo.	150 beds
Buffalo, N.Y.	1,000 beds
Albany, N.Y.	1,000 beds
Brooklyn, N.Y.	1,000 beds

"Bids have been received and are now under consideration for the 250-bed general medical and surgical hospital at Fresno, Calif.

"Study has revealed that $535,900,000 is available for construction costs of 61 other hospitals in the program, ranging from 150-bed general medical and surgical installations to a 1,250-bed neuropsychiatric hospital."

Early in 1946, engineering estimates revealed that rising construction costs had already outdistanced the $331,452,814 originally voted the Veterans Administration for its hospital program. At that time General Bradley reported to Congress for instructions and for authorization of an additional $441,250,000 for completion of the program.

"Even today," General Bradley states, "we have no assurance that labor and material costs will not continue to rise above existing market prices. We must realistically recognize that even those savings to be made in the modification of design can be wiped out by further increases in cost."

◆

German Technical Data Made Available in United States

APPROXIMATELY 5,000 reels of microfilm (500,000 different documents comprising 5,000,000 pages) of German technical industrial data, including 145,000 patent applications, have been brought to the United States by the Department of Commerce, in cooperation with the War Department, England, France and other wartime Allies. The microfilm records important detailed data on German technology and supplements and extends the work of the teams of experts which operated during and immediately after the war. Most of the data were photographed from original German documents in industrial plants, universities, and government offices by American specialists who were expert in both their respective technical fields and the German language.

In its "Bibliography of Scientific and Industrial Reports" the Department of Commerce will make available a complete list of the 5,000 reel titles as well as abstracts of the different subjects of the reels.

With this wealth of material at hand the Department needs the assistance of qualified groups and individuals in determining the relative importance of the various topics, and later in reviewing and evaluating the documents. Although no funds are available to compensate for this assistance, the data are sufficiently valuable so that groups and individuals should find it of great professional interest to join with the Department in preparing the information so that it can be assimilated by industry.

Reviewers and evaluators will have the benefit of detailed scrutiny of the original German material, and they will be permitted under the Department's auspices to write professional articles for publication. The articles will be included in a forthcoming government compendium of German wartime technology. Further information is available from John C. Green, Director, Office of Technical Services, Department of Commerce, Washington 25, D.C.

◆

Colombians Form Branch of Sanitary Organization

BOGOTÁ ENGINEERS ARE organizing a Colombian Section of the Inter-American Association of Sanitary Engineering, a hemispheric organization that has its seat in Washington, D.C.

The new section expects to hold its first meeting before the conference of the Association scheduled for November in Santiago, Chile. Membership committee members in Bogotá are Jorge Triana, M. ASCE, chairman; Roberto Espinosa-Parga, Jun. ASCE; Jorge Forero Vélez, Luis Pachón-Rojas, and Lewis A. Young, Assoc. M. ASCE.

The Inter-American Association of Sanitary Engineering is a product of two regional conferences on sanitary engineering held recently in South America. The first one was in Rio de Janeiro, Brazil (see CIVIL ENGINEERING, May 1946, p. 234), in June 1946, and the second in Caracas, Venezuela, in November 1946.

◆

New Agency Will Coordinate Federal Housing Activities

COORDINATION OF the housing activities of the federal government is authorized under the President's Reorganization Plan No. 3 put into effect by Senate approval during the last session of Congress. Under this plan the President is empowered to set up a new permanent Housing and Home Finance Agency, headed by an administrator responsible for the general supervision and coordination of three housing agencies already in existence, namely the Home Loan Bank Board, Federal Housing Administration, and Public Housing Authority. These agencies will maintain their own identities, however, and continue to be responsible for the operation of their own programs.

In the overall agency a National Housing Council will be created, to consist of representatives from the three main constituent bodies as well as from the Veterans Administration, the Reconstruction Finance Corporation, and the Department of Agriculture.

Raymond M. Foley of Michigan has been chosen by President Truman to head the Housing and Home Finance Agency. Other Presidential appointments include Frank D. Richards of Utah, as commissioner of the Federal Housing Administration, and Dillon S. Myer of Ohio, as commissioner of the Public Housing Administration.

◆

Traffic Death Rate Drops as Travel Mileage Rises

PROGRESS in the national fight against highway accidents is reflected in a report for the first half of 1947, which shows a continuing downward trend in the death rate despite rising travel mileage and greater accident exposure.

The midyear death rate was 8.2 per 100 million miles of travel, according to the National Safety Council. At the halfway mark last year the rate was 9.9 and at the end of the same period in 1941 the death rate was 10.9. This year's improvement was accomplished despite the fact that motor vehicle travel mileage on all rural roads had increased 9.7 percent over the same period of 1946 and was 11.7 percent above the six-month total in 1941.

An almost continuous drop in fatality rate has been reported by the Safety Council since the first of the year. Last year ended with a death rate of 9.9 for the year. January's rate was 8.7; February boosted it to 8.9 but succeeding months followed a declining pattern to set the half-year rate at 8.2.

N. G. NEARE'S Column

R. Robinson Rowe, M. ASCE

At the September meeting of the Engineers Club there was a demoralizing departure from the traditional impressive formality. Joe Kerr started it by shoving the table service out of his way, extracting a deck of cards from his pocket, and shuffling them before a group of expectant members. The chair was about to call the game out of order when 3 more decks appeared and Professor Neare rose to explain. "They are just analyzing the Amby Dexter problem of Guest Professor Burr and I think Tim had better coordinate them."

"Right away, Noah. The boys are shouting 'Eighteen' and 'Five' and are ready for the showdown. Which do you say, Joe?" "Five, Professor Burr, and I've brot my deck to prove it. When an even number of cards are cut into two equal parts and riffled together perfectly, each card of the top half moves to a position twice as far from the top and each card of the other half moves to a position twice as far from the bottom. By trying decks of all sizes up to 52 cards, I found that a 22-card deck alone would repeat its order after 11 riffles. Counting from the top, the first card traveled thru the following positions: 1, 2, 4, 8, 16, 9, 18, 13, 3, 6, 12, 1. So Amby kept 32 cards, which repeated after 5 riffles, the top card traveling thru the cycle 1, 2, 4, 8, 16, 1. I'll show you."

"You don't have to, Joe; I believe you, but I'll listen to the opposition."

"I'm the opposition," said Cal Klater. "If Joe shuffles the whole deck, the top card will take the positions: 1, 2, 4, 8, 16, 32, 11, 22, 44, . . . and won't return to the top in 8 riffles as Amby's did. Amby riffled the bottom card first so that it stayed on the bottom and the top card stayed on top.

"Suppose, for a deck of n cards which repeats its order after r riffles, that we let $p_0, p_1, \ldots p_r = p_0$ be the successive positions of any card and number these positions in the deck from 0 to $n - 1$. Before and after a cut and riffle the order is:

$$0, 1, 2, \ldots \frac{n}{2} - 1, \text{CUT}, \frac{n}{2}, \frac{n}{2} + 1, \ldots n - 1$$

$$0, \frac{n}{2}, 1, \frac{n}{2} + 1, 2, \ldots \frac{n}{2} - 1, n - 1$$

So for the top half of the deck $p_1 = 2p_0$ and for the bottom half $p_1 = 2p_0 - (n - 1)$, each of which can be represented,

$$p_1 = 2p_0 - a(n - 1)$$

Letting a, b, c, d, and e be 0 or integers, we continue,

$$p_2 = 2p_1 - b(n - 1) = 4p_0 - c(n - 1)$$
$$p_r = 2^r p_0 - d(n - 1) = p_0$$
$$p_0(2^r - 1) = d(n - 1)$$
$$2_r - 1 = e(n - 1)$$

"This general solution is usually expressed as a congruence. When $r = 11$, $e(n - 1) = 2{,}048 - 1 = 23 \times 89$; so $n - 1 = 23$ and $n = 24$. Amby kept the other 28 cards, and for $n = 28$, the least value of r satisfying the equation is 18, which is my answer."

"And my answer, too," said Professor Burr. "Noah, we should point out a moral: Watch the dealer that riffles 8 times!"

"Why not simply, 'Watch the dealer,' Tim? Thanks for a good teaser. For a new one I'm going to introduce Guest Professor D. Sy Ford, and don't let his youth disarm you."

"Not new, Noah; just an old easy one upped to an engineer's I.Q. If 3 weights are alike and a 4th a bit over- or underweight, it can be spotted in 2 weighings on a 2-pan balance. Similarly, the odd one of 12 weights can be found in 3 weighings. From how many weights can an odd one be spotted in 4 weighings?"

[*To two Kerrs there were seven Klaters: Anne Othernut* (J. Chas. Rathbun), *H. Herbert Howe, Isidore Knobbe* (*Joseph S. Lambie*), *E. P. Goodrich, John L. Nagle, Howard B. Stanley, and Kum Pewter* (*Walter Steinbruch*). *Guest Professors Tim Burr and D. Sy Ford were Charles F. Ruff and Allan M. Newman.*]

◆

Perpetual Motion Machine Designed for Usable Power

As an addition to Prof. Borg's article dealing with perpetual motion (July 1947 Civil Engineering, page 39) I submit the following:

Perpetual motion machines are of two types (*a*) those that run perpetually since they use no power and (*b*) those that create their own power. An example of the first kind is a spinning ball floating in a vacuum. These machines are of no value except as oddities. The second type when perfected will be of more value than the internal combustion engine.

Some years ago I found the machine illustrated (Fig. 1) in a textbook. I have kept this secret in the hopes that I could sell my idea to some power company. Of course I should first make a model, but I have been unable to find a way to stop the machine once it gets started—so I do not want to start anything I can't finish.

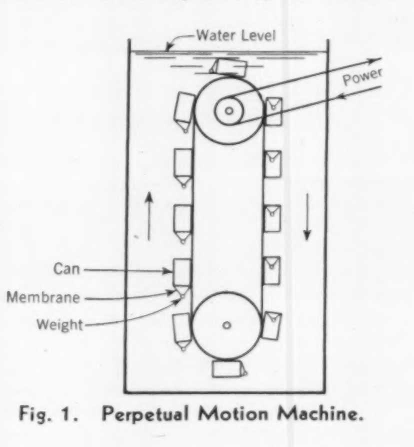

Fig. 1. Perpetual Motion Machine.

The principle involved is one of unequal forces caused by differences in displacement made possible by an ingenious device. A series of tin cans is fastened to a belt placed about two pulleys and submerged in a tank of water as shown in Fig. 1. Flexible membranes over the openings of the cans are weighted so as to cause greater displacement when the cans are inverted.

The figure represents a crude working model. Later refinements would no doubt streamline the bottoms of the cans to give less resistance and therefore a greater working efficiency. The resistance, however, may be found to serve a useful purpose in holding down the speed of the machine to a reasonable rpm.

Is it not true that the whole prejudice against perpetual motion machines is the belief in the dogmatic statment of "conservation of energy"? This statement has never been satisfactorily proved and so of course may not be true.

Yours with LXXX
Anne

◆

Special-Mix Concrete Speeds Opening of N.J. Overpass

Normal curing time was shortened and the removal of construction barriers hastened by the use of special-mix concrete on New Jersey's recently completed Newark overpass, according to R. M. Beck, highway department construction engineer for Comdr. Charles M. Noble, M. ASCE, state highway engineer. The new overpass was built to provide relief for traffic at what State Highway Commissioner Spencer Miller, Jr., calls "the state's worst bottleneck." This is on the "the world's heaviest traveled artery," a designation applied to Route 25 adjacent to the Newark Airport following a peak traffic count of 123,000 in a single day.

The overpass is included in the $3,000,000 investment of the State of New Jersey for the modern eight-lane roadway nearing completion on the three miles of Route 25 (U.S. 1) from North Avenue, Elizabeth, to Port Street, Newark. When the remaining reconstruction is finished near the Newark Airport, traffic-circle bridges will separate crossings at grade to eliminate accident hazards and slow-ups in weaving around the former Routes 21, 25, and 29.

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Inter-American Sanitary Group to Meet in Santiago, Chile

THE INTER-AMERICAN Association of Sanitary Engineering and the Institute of Engineers of Chile are collaborating on arrangements for the Third Inter-American Sanitary Engineering Conference, to be held in Santiago, Chile, November 20–27, 1947. The recently formed Chilean Section of the Inter-American Sanitary Engineering Association is in charge of conference plans.

At the head of the Chilean Conference Committee is Ruperto Casanueva, Jun. ASCE, and U.S. participation in the conference is being coordinated by C. I. Sterling, Jr., Institute of Inter-American Affairs, Washington, D.C. Further information may be secured from The Secretary, Inter-American Association of Sanitary Engineering, N.W. Corner, 17th & Constitution Avenue, Washington 6, D.C.

Meetings and Conferences

American Society of Mechanical Engineers. Discussion of materials handling and problems of heat transfer in process industries is being featured at the fall meeting of the American Society of Mechanical Engineers, held at the Hotel Utah in Salt Lake City, September 1 to 4, inclusive.

American Water Works Association. Latest developments in sound water-works practice are being discussed at the two-day Northeastern Round-up Meeting of the American Water Works Association, being held at the Hotel Champlain, Plattsburg, N.Y., September 4 and 5. The New York Section of the Association is host.

American Welding Society. Welding applications and research will be stressed at the 28th annual meeting of the American Welding Society, planned for October 19 to 24, at the Hotel Sherman, Chicago, during the National Metal Exposition. There will also be welding and cutting exhibits at the exposition (to be held in the National Amphitheater, Chicago, October 18 to 24).

Illuminating Engineering Society. The Illuminating Engineering Society will complete its 42nd year with a National Technical Conference, scheduled for the Hotel Roosevelt in New Orleans, La., September 15 to 19.

Instrument Society of America. The program of the Second National Instrument Conference—to be held at the Stevens Hotel, Chicago, September 8 to 12—will feature what may be done by means of instrumentation. The conference is sponsored by the Instrument Society of America.

Machine Tool Show. Machine tool users here and abroad are registering for the 1947 Machine Tool Show, sponsored by the National Machine Tool Builders' Association. The show will be held in the Dodge-Chicago plant, Chicago, September 17 through 26. There will be a dinner in honor of foreign visitors on Tuesday evening, September 23.

National Transit Safety Conference. Recent developments in the safety field will be covered at the National Transit Safety Conference, which will take place in Chicago, September 9 to 11. The National Safety Council and the American Transit Association are joint sponsors.

Royal Netherlands Institution of Engineers. The centennial celebration of the Royal Netherlands Institution of Engineers will be held in The Hague, Netherlands, during the week commencing September 22.

U.S. Chamber of Commerce. The role of businessmen in solving community problems arising from traffic congestion will be highlighted at the Businessmen's Conference on Urban Problems, to be held in Washington, D.C., September 11 and 12, under the sponsorship of the U.S. Chamber of Commerce.

Wool Gatherings

by WOOLLEY

THE GREATEST NUMBER of Engineers is employed in the electrical, petroleum, chemical, and aircraft and instrument industries.

A NEW WATER DEMINERALIZER has been developed, designed to transform ordinary tap water into the chemical equivalent of distilled water.

NEW OFF-STREET parking facilities were opened by 65 cities last year to reduce downtown traffic congestion.

NINETY-EIGHT YEARS AGO John A. Roebling was commissioned to build a bridge across Niagara Gorge.

SAN DIEGO'S 72-mile aqueduct to bring Colorado River water to that city is expected to be completed this year.

OF MORE THAN 100,000 miles of concrete pavement built on state rural primary highway systems since 1910, about 80 percent of it was still in service at the beginning of 1946.

THERE ARE approximately 1,500 tunnels in the U.S. with an aggregate length of about 320 miles.

DURING DRY MONTHS, 20 percent of the Ohio River as it flows by Louisville is raw sewage.

MORE THAN 83,000,000 gal of water are used daily within the City of San Francisco.

AN ULTRA-SENSITIVE flame detector developed by the Naval Research Laboratory will spot a match flame yards away or sound an alarm at the sparks from the wheel of a cigarette lighter.

TUNGSTEN FOR USE in high-grade light bulbs must be 99.99 percent pure. It is pressed into bars and drawn into strands $^{1}/_{5}$ the diameter of a human hair.

THE PROPOSED PLAN of development of Columbia River Basin contemplates 238 projects to cost $5,600,000,000.

A NEW HYDROELECTRIC project with 63,000-kw capacity is to be built by a Swiss firm in Peru at a cost of some $12,000,000.

TWENTY YEARS AGO Dr. Harvey C. Rentschler, Director of Research for the Westinghouse Lamp Division, and his associates worked for about a year before they found a way to make pellets of pure uranium. This knowledge gave America a head start in the race toward atomic bombs.

ABOUT 100 YEARS AGO the pioneer photographer Fox Talbot first introduced a photographic process involving a negative and a positive.

THE FIRST TRANSMISSION of television over wire circuit, Washington, D.C., to New York and by radio from Whippany, N.J., to New York took place on April 7, 1927.

BARELY HALF THE UNITED STATES is topographically mapped in some manner and less than one-quarter of the country is covered by maps of sufficient detail to meet present-day engineering requirements.

New Publications

Steel Products. Three new sections in the Steel Products Manual, which is being issued in installments by the American Iron and Steel Institute, are now available. These are Section 2, covering "Semifinished Carbon Steel Products for Forging"; Section 23, entitled "Tolerances for Alloy Steel Sheets and Strip"; and Section 27 on "Rail Steel." Copies may be purchased from the American Iron and Steel Institute, 350 Fifth Avenue, New York 1, N.Y., at a cost of 25 cents each postpaid.

Engineering Research. Research facilities and projects currently under way in the leading engineering schools of the country are detailed in a 103-page *Directory of Member Institutions and Review of Current Research*, 1947, compiled and published by the Engineering College Research Council of the American Society for Engineering Education. The volume sells for $1, and may be obtained from the Engineering College Research Council at the State University of Iowa, Iowa City, Iowa.

Neighborhood Planning. The use, application, and value of subdivision regulations and protective covenants in planning stable, attractive neighborhoods are discussed in detail in Technical Bulletin No. 8 of the Urban Land Institute. The bulletin which is entitled "Subdivision Regulations and Protective Covenants; Their Application to Land Development," may be purchased for $1 by writing to 1737 K Street, N.W., Washington 6, D.C.

EJC Commission on Latin America. Reprints from engineering periodicals of the four Founder Societies and the American Institute of Chemical Engineers are included in the first issue of *Adelantos de Ingenieria*, a new quarterly for engineers in Latin America being published by the Engineers Joint Council Commission on Latin America. Articles are selected for reprint by a board of editors from the Founder Societies and the AIChE, headed by Lloyd J. Hughlett, managing editor of *Ingenieria Internacional*. Request for the quarterly should be addressed to *Adelantos de Ingenieria*, 29 West 39th Street, New York 18, N.Y.

Beach Erosion. To facilitate the work of agencies engaged in hydrographic surveying, the Beach Erosion Board has published the results of recent investigations of its Field Research Group in a mimeographed bulletin. Copies may be obtained from the Beach Erosion Board, Corps of Engineers, Washington 16, D.C.

Housing. Alumni and faculty of Ohio State University have contributed timely articles to a special "Housing Edition" of the Engineering Experiment Station News. Subjects covered in the 60-page publication range from the early architecture of Ohio to modern problems of housing for veterans. Inquiries should be addressed to the Engineering Experiment Station News, Ohio State University, Columbus, Ohio.

Pavements for Airports. Flexible pavement-requirements for airports and for highways carrying dense, heavy traffic are outlined in Technical Bulletin No. 118 of the American Road Builders Association.

A report delivered at the Second Annual Michigan Aeronautics Conference—held in Lansing in May 1947—comprises the bulletin, which may be obtained from the American Road Builders Association, 1319 F Street Northwest, Washington 4, D.C.

Water Resources. Another report in the current series being prepared by the Ohio Water Resources Board in cooperation with the Water Resources Branch of the U.S. Geological Survey—entitled "Ground-Water Conditions in Butler and Hamilton Counties, Ohio"—is now available. The study, issued as Bulletin No. 8, may be purchased from the Ohio Water Resources Board, Columbus, Ohio, at a cost of $1 a copy.

Maps. Two Army Corps of Engineers series of maps—"Maps of the Yazoo, Tallahatchie and Coldwater Rivers in Mississippi" and "Maps of the Big Sunflower River in Mississippi"—drawn to an approximate scale of 1 in. to 1 mile, are now available. They were prepared by the District Engineer of the Vicksburg Engineer District, Vicksburg, Miss., and inquiries should be addressed there.

◆

Scrap Steel Prices Higher Than Those for New Steel

HEAVY MELTING STEEL SCRAP, one of the major raw materials for making new steel, has increased so much in price that it sells for more than new steel ingots, according to the Committee on Iron and Steel Scrap of the American Iron and Steel Institute.

Published delivered prices of No. 1 heavy melting scrap were approximately $43 per gross ton on August 7 in the Pittsburgh area and in several other districts, and $45 at Youngstown. The published base price of ingots is $36 per ton, f.o.b. mills.

The Committee has been urging the acceleration of government surplus activities and the return of scrap from overseas. It is studying the possibility of purchasing scrap from foreign nations.

Shipments of finished steel in the first six months of 1946, at 31,172,157 tons, were greater than ever before in peacetime and were almost as large as in the entire year 1939, according to a recent announcement of the American Iron and Steel Institute.

◆

Cleveland Building Code Is Brought Up to Date

PUBLIC HEARINGS WILL BEGIN soon on the preliminary draft of Cleveland's new building code, now nearing completion. The new code, which will replace provisions dating back to 1904, has been issued chapter by chapter to technical committees for review and comment. Included on the committee of architects and engineers are representatives of all the professional organizations that will use or be affected by the code, among them the ASCE.

A special effort is being made to phrase and arrange the code for maximum clarity. Separate chapters outline basic requirements for each classification of occupancy so that the architect or engineer will be able to determine the standards for any building by reference to a single chapter without detailed study of the entire code.

NEW IN Education

ONE IN EVERY NINE VETERANS in school under the G.I. Bill is learning some phase of engineering, a Veterans Administration sampling of school-going veterans disclosed. Of the total of 1,825,000 veterans in educational institutions on May 1, the survey showed 229,000 engineering students. Most of them, or 172,000, were enrolled in colleges and universities. The remaining 57,000 were in trade and industrial schools or other institutions at the non-college level.

The period of education to which a veteran is entitled depends upon the length of active military duty. He receives one year, plus one month for each month of military service, up to a maximum of four years. While in school, he may receive a subsistence allowance from VA of $90 a month if he has dependents, or $65 if he has none—provided he has no other income. For purposes of education and training, loan guarantees and readjustment allowances provided in the G.I. Bill, and for vocational rehabilitation of disabled veterans under Public Law 16, the period considered as war service is September 16, 1940, through July 25, 1947.

COURSES IN THE FIELDS of civil and electrical engineering are being added to the curricula of the College of Mines, University of Texas, and the first degrees in these fields will be given at the June 1949 commencement.

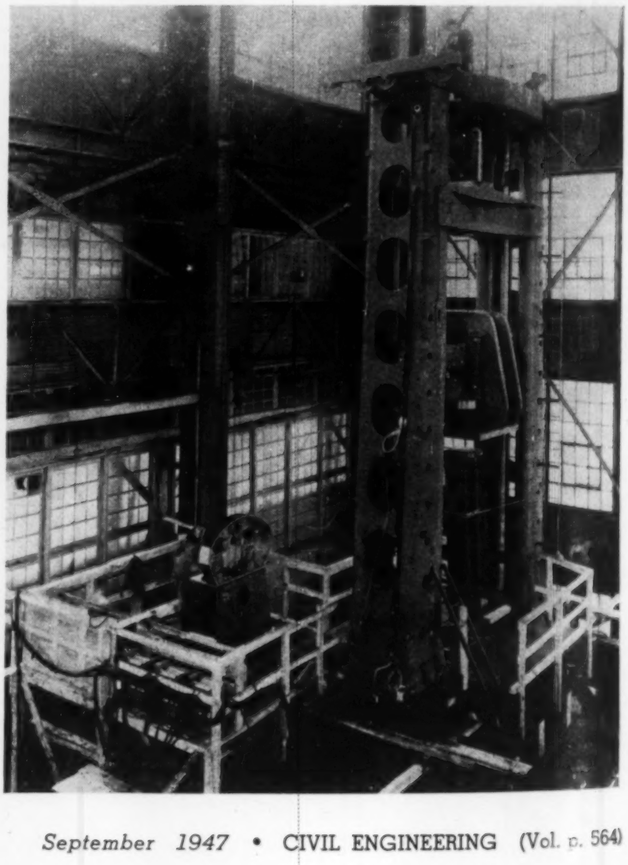
In commenting on the new program, Prof. Floyd Decker, chairman of the department of engineering, stated that "the course of study has been planned with the idea of giving the student a thorough basic training which he cannot get after graduation, leaving a large part of his specialization to professional employers. Most engineering and manufacturing concerns prefer students with this type of training."

Two large buildings furnished by the federal government as laboratories and classrooms for the engineering, physics and chemistry departments will be available for the fall semester, and a permanent addition to more than double the capacity of the present engineering building is planned for early construction.

GARBAGE AND REFUSE collection and disposal problems will be treated in a two-day in-service course for public works officials offered by the University of Michigan School of Public Health, October 27 and 28, 1947. The course undertakes to analyze and organize into readily usable form basic factual information correlated with practical experience. Applications for enrollment should be submitted in writing to the University's School of Public Health, Ann Arbor, Mich., as soon as possible. Enrollment closes October 20.

UNIVERSITY OF WASHINGTON GETS NORTHWEST'S LARGEST TESTING MACHINE

ADVANCED structural design features give the University of Washington's new testing machine from 300 to 400 percent greater rigidity than earlier designs. Weighing 300,000 lb but capable of exerting a force of 2,000,000 lb, the machine will be used for testing aircraft parts and other products of industries in the Northwest according to Prof. F. B. Farquharson, M. ASCE, head of the university's testing program. After erection at the Baldwin Locomotive Works, Eddystone, Pa., the huge machine was dismantled and shipped via the Panama Canal for final assembly in the Structural Research Laboratory where it is to be permanently housed.



"The Arthur Morgan Company

OF ST. LOUIS, MISSOURI

• Won a New Contract!"

AIRCO TECHNICAL SALES SERVICE REPORT

B82
BOTTOM RING A3
BOTTOM RING A4

PROBLEM: To move and to re-erect seven surplus storage tanks from a closed U. S. Arsenal to a new location. These 21 foot high, 24 foot diameter tanks had to be moved with a minimum of dismantling and without distortion.

SOLUTION: We advised machine gas cutting the ½" thick tank plates into six sections with an Airco #10 Radiagraph. A "track" to guide the Radiagraph was cut, tack welded into position around the tank and the tank cut into three horizontal sections. These three sections were then cut in half, loaded on a truck, and moved to the new location where they were reassembled by arc welding. These "new" tanks, welded and leak-proof, proved entirely satisfactory and as a result the Arthur Morgan Company won a new contract to move an additional 35 tanks.

W. Ruffley

Airco Technical Representative

Airco's Technical Sales Division is at the call of all industry in applying Airco processes and products in the solution of their problems. If you have a metal working problem, ask to have a Technical Sales Division man call. Address: Dept. CE-6017, Air Reduction, 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., Houston 1, Texas.

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NEWS OF Engineers

George E. Large has been appointed chairman of the department of civil engineering at Ohio State University, succeeding **Prof. Clyde T. Morris,** who is retiring after 41 years on the staff. Professor Large has been on the Ohio State faculty since 1929—for nine years as structural research engineer in the Engineering Experiment Station. He is the author of several Experiment Station bulletins on structural research and of a forthcoming text on reinforced concrete design. At present he is collaborating with Professor Morris on a research project to evaluate the plastic stresses in reinforced concrete beams.

George E. Large

Clyde T. Morris

Lorenz G. Straub, head of the civil engineering department at the University of Minnesota and director of the St. Anthony Falls Hydraulic Laboratory, is the recent recipient of a Navy award for "exceptional service in naval ordnance development." On leave from the university during the war, Dr. Straub served with the Office of Scientific Research and Development in the coordination of research on the development of ordnance for undersea warfare and rocket weapons.

Joseph A. Novaro is now an associate in the New Haven, Conn., firm of Clarence Blair Associates, Inc. He was formerly an engineer for the organization. Other members of the firm are **Roger C. Brown Frank Ragaini,** and **James C. Beach.**

Nathan L. Smith, chief engineer of the city of Baltimore, Md., was recently elected president of the Engineers Club of Baltimore.

Carl H. Knoettge and **Rhuel A. Andersen** have formed a civil and structural engineering practice, with headquarters in the Boston Building, Denver, Colo. Mr. Knoettge was formerly with the Denver Municipal Water Works, and Mr. Andersen in the U.S. Bureau of Reclamation at Denver.

Calvin Joyner is now director and adviser to the Korean Director of the Department of Commerce, American Military Government in Korea. During the past year, Mr. Joyner has also been one of the 12 members of the U.S.–U.S.S.R. Joint Commission in Seoul, engaged in trying to settle the country's economic and political problems. Mr. Joyner may be addressed at HQ, USAMGIK, Department of Commerce, APO 235, Unit 2, c/o Postmaster, San Francisco, Calif.

Arthur P. von Deesten, following his recent release from the Army Corps of Engineers, with the rank of lieutenant colonel, has returned to his position in the engineering department of the city of Los Angeles.

Lawrence G. Rice and **C. C. Wilbur** have joined the staff of Gannett Fleming Corddry and Carpenter, Inc., engineers of Harrisburg, Pa. Mr. Rice will be chief designer in the sewage-treatment department, and Mr. Wilbur will take charge of an office the organization has just opened in Scranton, Pa., to handle projects in the northeastern part of the state.

Representative Carl Hinshaw, of California, will head the Congressional commission of five Senators and five Representatives, recently appointed to investigate and recommend an air policy at the next session of Congress.

M. C. Patton has been advanced to the position of executive vice-president of Armco Drainage and Metal Products Inc., a subsidiary of the American Rolling Mill Co. He was previously general manager.

Thomas L. Kelly is now structural field engineer for the Portland Cement Association in western New York, with headquarters in Buffalo, N.Y.

Lt. Col. William F. Cassidy has assumed new duties as assistant to the president of the Mississippi River Commission, and division engineer of the Lower Mississippi Valley Division of the U.S. Engineer Office. Since his return from wartime service overseas, Colonel Cassidy has been serving as chief of the Plans and Training Division, Military Operations, in the Office of the Chief of Engineers, Washington, D.C.

C. A. Willson, until lately chief of the Building Code Division of the National Housing Agency, Washington, D.C., has been appointed research engineer for the Committee on Reinforced Concrete Research of the American Iron and Steel Institute, New York City. In this new capacity, he succeeds the late **Roy Zipprodt.**

Ernest B. Crane is now chief engineer for the Western lines of the Chicago, Milwaukee, St. Paul and Pacific Railroad, with headquarters at Seattle, Wash. He was previously principal assistant engineer for the line at Seattle.

Ray L. Derby, formerly senior sanitary engineer for the Los Angeles Department of Water and Power, has been appointed principal sanitary engineer. He succeeds **Raymond F. Goudey,** who recently resigned.

Charles C. Bayles has severed his connection as housing expediter at Eugene, Ore., to establish a consulting practice there.

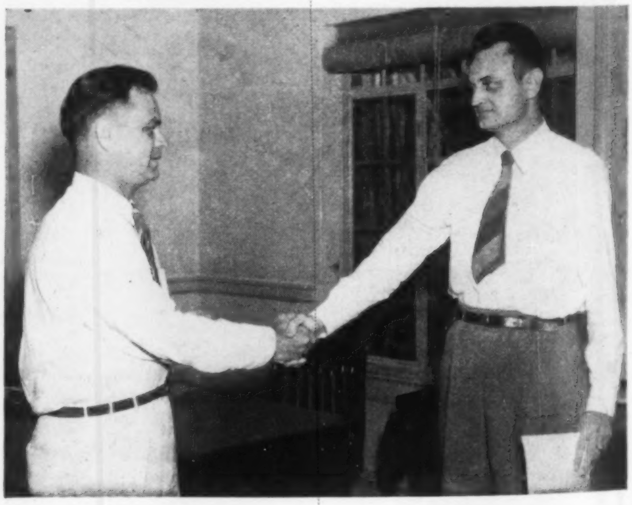
Roy E. Jorgensen has been appointed deputy highway commissioner of Connecticut. Mr. Jorgensen has been in the Connecticut Highway Department since 1937—for the past five years in the capacity of director of highway planning.

Samuel L. Hollopeter will act as South American representative for the Chicago consulting firm of De Leuw, Cather & Co. As director general of the Empresas Publicas Municipales, Barranquilla, Colombia, for the past 20 years, Mr. Hollopeter has had extensive engineering experience in South America.

Frederick W. Crane, city engineer of Buffalo, N.Y., was recently appointed general manager of the Buffalo Sewer Authority.

William J. Cox has become connected with the New York firm of Mayer & Whittelsey, for which he will soon go to Bombay, India, to make a traffic survey. Mr. Cox recently resigned as Connecticut state highway commissioner.

IN RECOGNITION of outstanding devotion to duty at Waterways Experiment Station, Vicksburg, Miss., Robert Y. Hudson (right) receives War Department award for Meritorious Civilian Service. Honor goes to Mr. Hudson for his wartime accomplishments in directing Wave Action Section of Hydraulics Division, Waterways Experiment Station, of which he is head. Presentation of award is made by Lt. Col. Ralph D. King, director of Station.



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George H. Jennings is now associated with **James J. Walsh,** San Francisco consultant, under the firm name of Walsh & Jennings, Associates. Mr. Jennings was previously an engineer for the California Packing Corp.

Morrough P. O'Brien, former dean of engineering at the University of California, has joined the staff of Air Reduction Company, Inc., to direct general and process engineering. During the war, Mr. O'Brien assisted in the design of the electromagnetic plant at Oak Ridge, Tenn., and served as a consultant to the Navy Department's Bureau of Ships.

Wells N. Thompson, vice-president of the H. K. Ferguson Co., New York City, has been appointed project director in charge of constructing and equipping the first peacetime atomic pile at Brookhaven National Laboratory. Mr. Thompson has been a member of the Ferguson organization for more than 25 years and, until his appointment to direct the company's activities in the atomic energy program, was in charge of the firm's Eastern district.

Roger T. Chandler, until lately with the Maryland Park and Planning Commission, is now assistant traffic engineer at Providence, R.I.

Paul Weir was recently appointed manager of the Atlanta, Ga., Water Department. He has been in the department since 1928, and has been assistant general manager for the past few years. President of the Georgia Engineering Society, Mr. Weir received the Fuller Award for outstanding engineering leadership in the South in 1940, and the Goodell Prize for research in corrosion control in 1941.

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Cherry Logan Emerson, dean of engineering at Georgia School of Technology, recently received the 1947 Distinguished Service Award, the highest honor that can be given to an alumnus of that institution. A 1908 graduate of Georgia Tech., Dean Emerson received the award chiefly for his contribution in planning and directing $4,000,000 worth of self liquidating construction on the campus. Prior to becoming dean of engineering in 1945, he was vice-president and chief engineer of Robert & Co., Atlanta engineers.

C. L. Emerson

Jack N. Sparling has joined the staff of Quinton Engineers, Ltd., Los Angeles, in the capacity of chief structural engineer. For the past five years Mr. Sparling has held a similar position with J. Gordon Trumbull, Inc., of Cleveland, Ohio.

George Raymond Russell, formerly chief engineer for the Ralph M. Parsons Co., of Los Angeles, is now project manager for the Bechtel Corp. on the design and construction of the coal hydrogenation demonstration plant for the U.S. Bureau of Mines at Louisiana, Mo.

Wallace D. Craig, assistant manager of asphalt sales for the Standard Oil Co. of New Jersey, has been elected vice-president of the Asphalt Institute, succeeding the late **Joshua S. Sawyer** both as vice-president and member of the Institute's executive committee. Mr. Craig will retain his position with Standard Oil.

Alfred J. Orselli, of Berkeley, Calif., has been promoted to the position of general manager of construction for the Bechtel Corp. He has been with the organization since 1933—most recently as construction manager for the company's northern division.

Deceased

Rupert Andrew Anderegg (M. '32) professor of civil engineering at the University of Cincinnati, died on July 18, at the age of 53. Professor Anderegg had taught at the university since 1921, and had been a full professor since 1941. During the first World War, he served overseas with the 21st Engineer Corps, and in the recent war was ordered to active duty with the Second Army headquarters at Memphis, Tenn. Long active in the Cincinnati Section, Professor Anderegg served a term as vice-president in 1939.

Walter Lacy Boyd (M. '23) civil engineer of Bartow, Fla., died recently. He was 72. For more than 25 years Mr. Boyd had a private engineering practice in Bartow.

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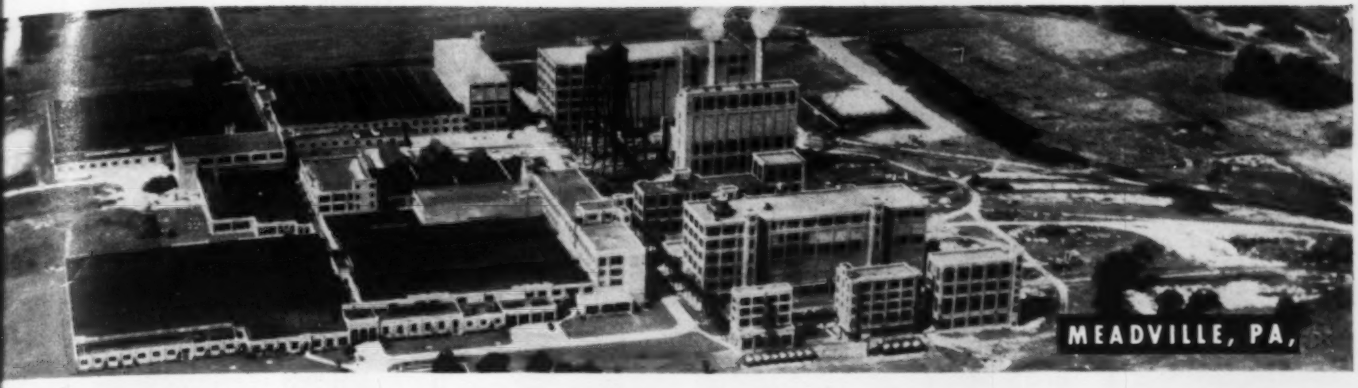

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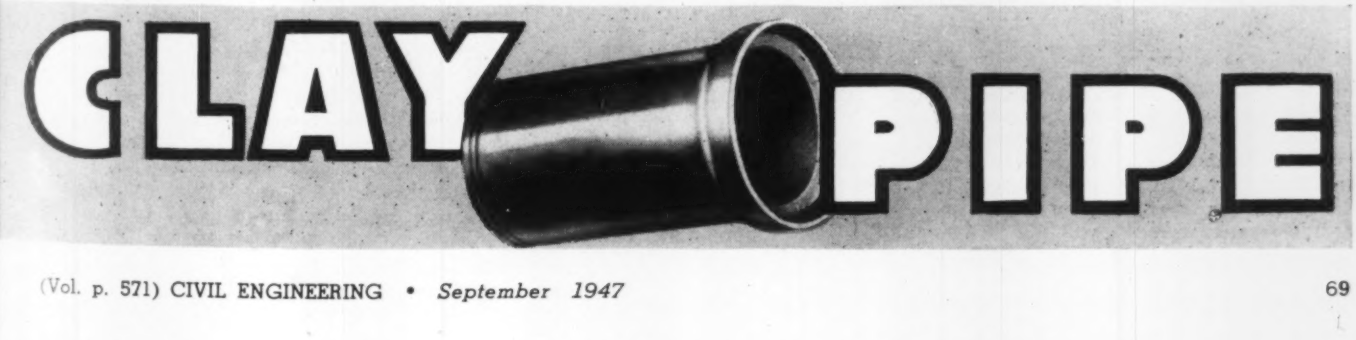

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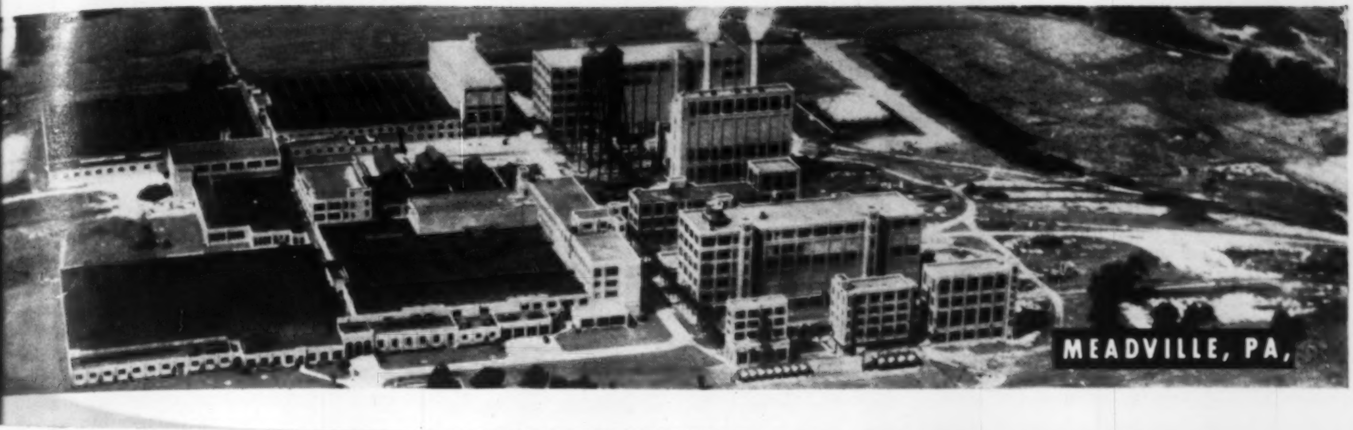

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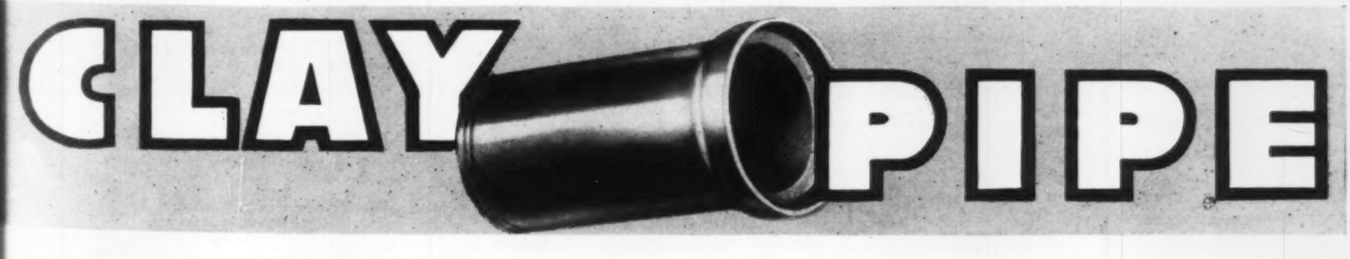


(*Continued from page 66*)

specializing in surveying and mapping work. He had also been deputy in charge of the Polk County Surveyor's Office, and engineering supervisor of various Florida projects for the WPA.

Robert Moore Dunham (M. '22) consulting engineer of Houston, Tex., died recently at the age of 64. Mr. Dunham had been vice-president and general manager of the Texas Willite Co.; general superintendent of the Texas Bitulithic Co.; and vice-president of the Western Roads Co. His work included the design and construction of an intercepting sewer for the city of Shreveport, La., and 45 miles of sanitary sewers for Fort Worth, Tex.

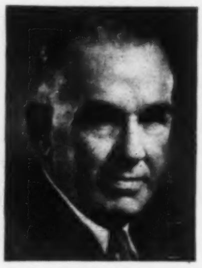
Vernon Louis Glaze (M. '43) chief of exploration work in the U.S. Engineer Office in Sacramento, Calif., was fatally stricken while driving his car near Fresno, Calif., on July 11. Mr. Glaze, who was 57, had been in the Sacramento district of the U.S. Engineer Office since 1933. Earlier in his career he was with the National Park Service at Portland, Ore.; field engineer in charge of power investigations and surveys in Washington; and design engineer on the Columbia Basin report.

Philip Guise (M. '18) retired civil engineer and architect, died at his home in Newton, N.J., on July 16. Mr. Guise, who was 75, had been assistant engineer for the New York City Department of Docks, and engineer-secretary for the Jersey City Development Commission. Before his retirement some years ago, he was city development engineer for Jersey City, taking an active part in the building of New Jersey piers.

Leslie Standish Hall (M. '41) principal hydraulic engineer for the East Bay Municipal Utilities District, Oakland, Calif., died on July 5, at the age of 55. Early in his career Mr. Hall was draftsman and designer for C. D. Putnam, and assistant engineer for Duryea, Haehl & Gilman, of San Francisco, Calif. Since 1924 he had been with the East Bay Municipal Utilities District. He was the author of numerous articles on hydraulics and hydrological subjects.

John Hunter Hanna (M. '04) chairman of the board of the Capital Transit Co., Washington, D.C., died in that city on June 28. He was 75. In 1894 Mr. Hanna joined the staff of the Washington & Georgetown Railroad Co. Later this line and the Rock Creek Railway were reorganized into the Capital Traction Co., and Mr. Hanna served as chief engineer and vice-president in charge of operations. Following a merger of the Capital Traction Co. and the Washington Railway & Electric Co. in 1933, Mr. Hanna was elected president of the newly formed Capital Transit Co. He had been chairman of the board since 1937.

Francis Haynes Hay (Assoc. M. '32) of Los Angeles, Calif., died on June 13, at the age of 59. Beginning in 1919, Mr. Hay was for a number of years with the Los Angeles County Flood Control District—as senior civil engineer, designing engineer, and chief hydrographer. During the first World War, he served as an officer in the Army Engineers Corps.



Fabian Bachrach

R. A. McMenimen

Robert Aloysious McMenimen (Assoc. M. '20) vice-president and director of the Raymond Concrete Pile Co., New York City, died suddenly on July 30 in Monrovia, Liberia, where he had gone to inspect the large harbor development being constructed by his company. Mr. McMenimen, who was 55, had been with the Raymond Concrete Pile Co. since 1919. In addition to the Liberian port project, he had under his direction, at the time of his death, several construction projects in South America and the Caribbean. One of the outstanding jobs he had charge of was the building of the seven-mile San Francisco Bay toll bridge between San Mateo and Hayward, Calif. During the recent war Mr. McMenimen was a member of the operating committee of the Contractors Pacific Naval Air Bases, which directed widespread operations for the Navy in the Pacific.

Henry Macy Jones (M. '33) of Balboa Island, Calif., died on July 18, at the age of 55. Mr. Jones was for a number of years in the office of the Los Angeles County Surveyor, and from 1932 until his retirement in 1945 was secretary of the California State Board of Registration for Civil Engineers. Long active in the Los Angeles Section of the Society, he served as president in 1939.

William S. Lea (M. '18) consulting engineer of Montreal, Canada, died suddenly at his country home at Senneville, Quebec, on July 5. He was 70. Born and educated in Canada, Mr. Lea gained early engineering experience with two Boston engineers—the late Freeman C. Coffin and the late Frank A. Barbour, Members ASCE. From 1913 until 1930 he was connected with his brother, the late R. S. Lea, M. ASCE, in an engineering partnership that advised on many important Canadian hydroelectric and water supply projects. From the latter date on he was retained by numerous Canadian municipalities and corporations.

Roland Winthrop Lefavour (Assoc. M. '24) assistant professor of civil engineering at Tufts College, Medford, Mass., died at Malden, Mass., on July 15. Mr. Lefavour, who was 58, had been on the engineering faculty at Tufts for more than 20 years.

Lloyd Earl Lumpkin (Assoc. M. '37) of Little Rock, Ark., died on January 11, 1945, according to word just received at Society Headquarters. Mr. Lumpkin who was 47, was Southern service manager of the Marquette Cement Co., Memphis, Tenn., at the time of his death. Earlier he had been with the Missouri State Highway Commission and the Arkansas State Highway Commission.

Charles Harvey MacCulloch (M. '14) former senior civil engineer in the New York State Department of Public Works, Albany, N.Y., died there on June 24, at the age of 70. Entering the state service in 1900, Mr. MacCulloch served continuously until his retirement in February 1947 except for a three-year period when he acted as consulting engineer on the design of the Albany water supply system.

Leon Hagop Nishkian (M. '24) consulting engineer of San Francisco, Calif., died recently. He was 65. A native of Turkey, Mr. Nishkian was educated in the United States and spent his career here. From 1912 to 1917 he was structural engineer for the Board of Public Works of the City of San Francisco, and since the latter date he had been in private practice in San Francisco—of recent years in partnership with his son, B. L. Nishkian, Assoc. M. ASCE.

Edward Culloden Panton (M. '23) construction manager for the Bechtel Corp., San Francisco, Calif., died recently at his home in Del Monte, Calif. Mr. Panton, who was 58, had been with the Bechtel Corp. since 1933. At the time of his death, he was in charge of construction on the Friant aqueduct of the Central Valley Project.

William Kershaw Peasley (M. '23) of Jamaica, N.Y., died on July 11, at the age of 70. Mr. Peasley's experience ranged from irrigation development in the Imperial Valley of California to construction of the Pig Point Ordnance Depot at Portsmouth, Va. As superintendent of construction for the J. H. Taylor Construction Co., Elkay Builders, Inc., and other New York engineering firms, he was in charge of building several New York skyscrapers and other buildings. More recently he had been valuation engineer for Albert M. Greenfield & Co., of New York, on property management and appraisals.

Harry Willet Rhodes (M. '17) retired superintendent of the 18th Lighthouse District, Berkeley, Calif., died in a hospital in that city on July 13. He was 77. Captain Rhodes retired in 1939 after 27 years as superintendent of the 18th Lighthouse District, which comprises 800 miles of California coast line and river systems. Prior to entering the lighthouse service, he spent 14 years as field officer for the U.S. Coast and Geodetic Survey, charting coastal waters off Panama, Alaska, Hawaii, and the Philippines.

Francis Joseph Seery (M. '21) professor emeritus of hydraulic engineering at Cornell University, died in Dover, Del., on July 27. Professor Seery who was 73, was on the Cornell faculty from 1905 until his retirement about two years ago. He was full professor from 1918 on. An expert on water-works valuation and hydrology, he had served as chairman of the Board of Public Works of Ithaca, N.Y. During the first World War, Professor Seery was superintendent of construction at Camp Dix, N.J., in charge of water and sewage.

Bernard Wick Shrubb (Jun. '43) of Freehold, N.J., was killed in a recent automobile accident. He was 26. Following Mr. Shrubb's graduation from the University of Alabama engineering school in 1943, he spent a year as draftsman for the Douglas Aircraft Co. in Los Angeles. He served in the Navy during the war, attaining the rank of lieutenant (jg). At the time of

(*Continued on page 74*)

Welded Construction Simplifies Face-Lifting Operation

By **WILLIAM B. MILLER, C. E.,**
Consulting Engineer for Walker & Weeks, Architects, Cleveland, Ohio

INTERESTING problems in the integration of structural iron work in two adjacent buildings were encountered in a remodeling job on the Williamson and Otis Buildings in Cleveland.

It was desired to extend a bank's quarters from the Williamson Building into the Otis Building, but this was complicated by the fact that the front of the Otis Building projected 4 inches over the building line. It was necessary to set back this front and apply a new front of terra cotta and granite to both buildings so that the architectural design would carry through.

The front of the Otis Building, being wall bearing, was supported at the second floor line by a box Warren type truss. In order to set the front back it was necessary to slice this truss in half in a longitudinal direction. The architectural design was so worked out that a girder beam could be erected below this truss and masonry walls carried up to support existing walls.

The first step was to install temporary shoring to carry the load of existing walls during alterations. Fig. 1 shows the welding of temporary needle beams to the bottom flange of the old truss. Welding was used to avoid any possible movement in the needle beams. Next, tubular struts were arc welded into the old truss at frequent intervals so that underpinning loads could be carried directly through the truss into the masonry wall above. Fig. 1 shows two of these tubular struts directly behind a gusset plate at a web intersection of the old truss.

Fig. 2, a general sketch, shows the new 21-inch I-beam erected on new columns beneath the old truss to assume the wall-bearing load and support new masonry. Cross-section shows the tubular struts and the lines of the old and new facing. A masonry wall was then installed from the top of this beam and dry packed to the underside of the truss. The truss was then cut longitudinally and filled in with masonry between the tubular struts to complete the job. After building loads were properly transferred to new 21″ beam (located below old truss), the shoring drums were removed and needle beams flame cut to clear new masonry.

The original columns of the Williamson Building, erected in the 1890's, were made by combining four Z-bars with exterior plates and interior lacing. Some of this lacing was strengthened during this remodeling with arc welding. To connect new beams into this type of column it was necessary to weld new plates between existing lacing of this column. At other points brackets were welded as shown in Fig. 3.

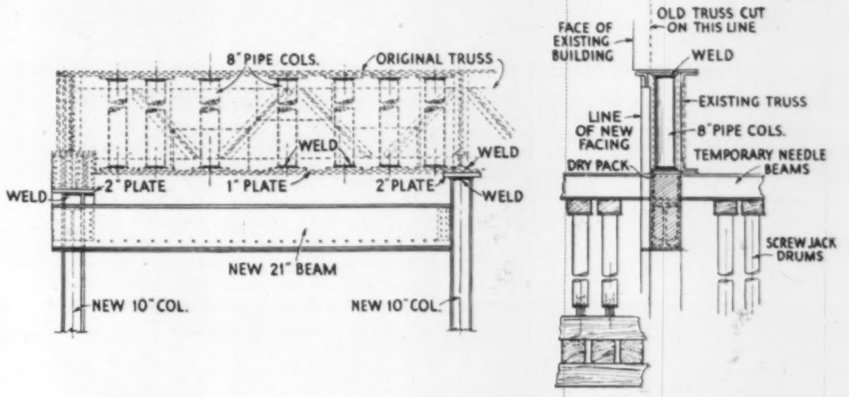


Fig. 2. Front view and cross-section showing alterations made in order to set wall back.

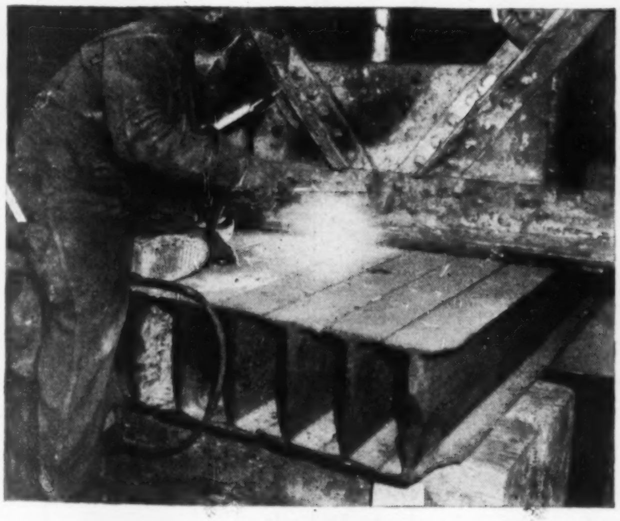


Fig. 1. Welding bottom of truss to needle beams acting as temporary support.

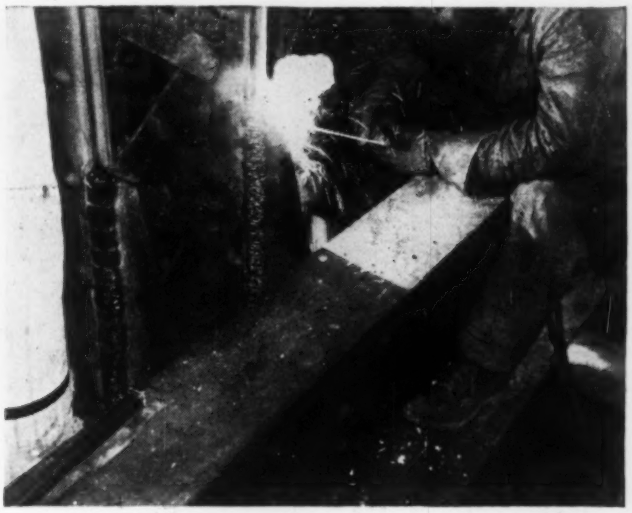


Fig. 3. Brackets from 21-inch I-beam are welded to existing column.

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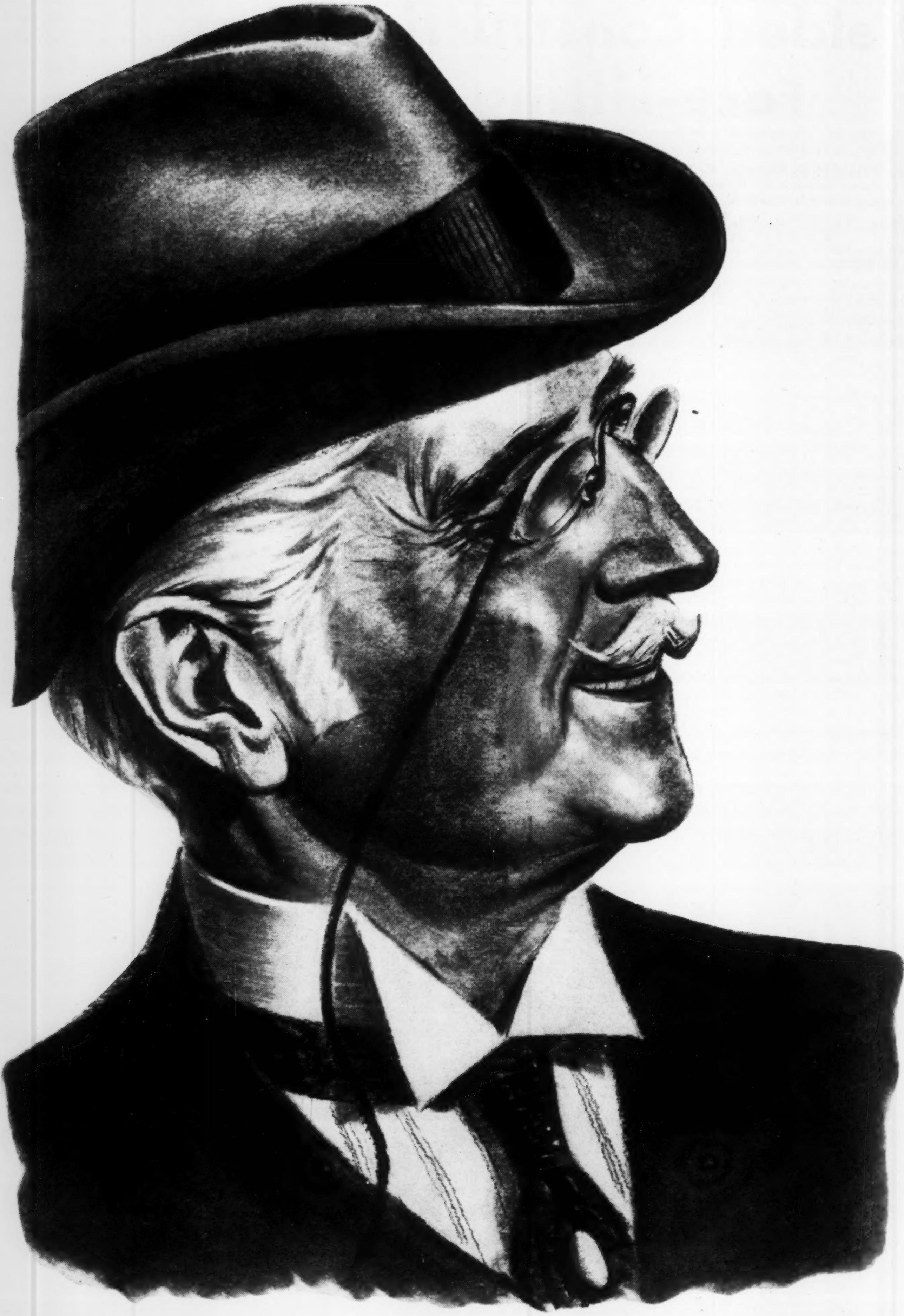

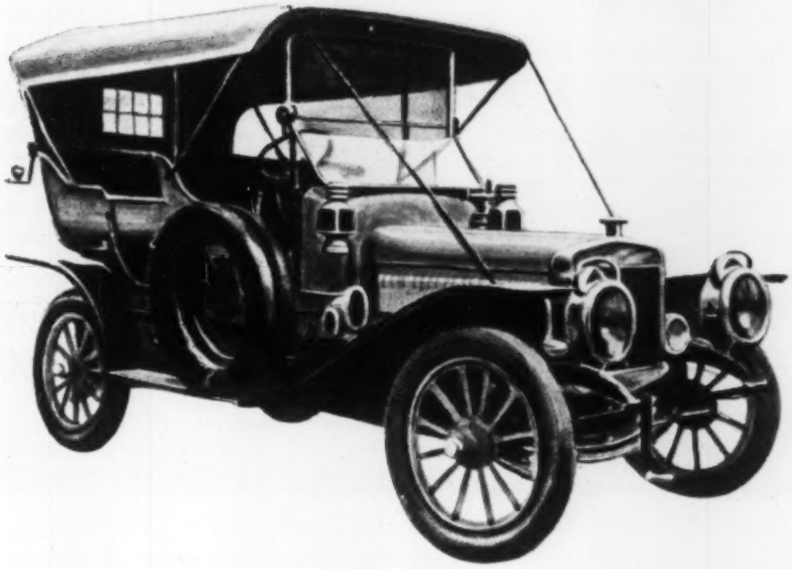

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J-M engineers combined asbestos and cement under great pressure, produced a material that did a better job. The new material was called Transite. Transite is rustproof, it cannot tuberculate, it resists even the most corrosive soils.

Then they designed a coupling made of Transite and named it the Simplex Coupling. Simple and effective, it consists only of a Transite sleeve and two rubber rings tightly compressed into position between sleeve and pipe. This construction guards against leakage and also provides flexibility at each joint. The flexibility helps to cushion the entire line against shock and soil stresses, permits a deflection up to 5 degrees at each joint.

Today you can have the engineering progress that goes into a streamlined car when you travel today's highways. Probably you'll want the advantages of modern engineering in the field of water transportation too.

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For all the facts about Transite, the *modern* water pipe, write Johns-Manville, Box 290, New York 16, New York.

JOHNS-MANVILLE
JM
PRODUCTS

(*Continued from page 70*)

his death he was a junior civil engineer with the American Express Co. in New York.

Joseph Emory Sirrine (M. '03) senior partner in the firm of J. E. Sirrine & Co., Greenville, S.C., died at his home in that city on August 7. He was 74. Mr. Sirrine founded his firm, which specializes in the design of power and industrial plants, in 1902. One of the South's leading industrial engineers, he was also chairman of the board of directors of Brandon Mills at Greenville, and vice-president and director of a number of other textile concerns in the Southeast. During the first World War, Mr. Sirrine was supervising engineer on the construction of Camps Bragg, Wadsworth, and Sevier.

Edward Simeon Skillin (Assoc. M. '08) vice-president of the Frederick Snare Corp., New York City, died at his home in Glen Ridge, N.J., on July 1. Mr. Skillin, who was 80, had been with the Frederick Snare Corp. (formerly the Snare & Triest Co.) since 1902. During his long tenure with the organization, he supervised the construction of bridges, docks, power plants, industrial buildings, and dams in the United States, South America, and the West Indies.

Chester Wason Smith (M. '32) retired engineer of Newburyport, Mass., died on July 22, at the age of 81. Early in his career (1895 to 1904) Mr. Smith was with the Boston Metropolitan Water Board, and from 1904 to 1910 with the U.S. Reclamation Service on the construction of Roosevelt Dam. Since the latter year he had been engaged on many irrigation, hydroelectric, and water-supply projects in this country and abroad, including the construction of harbor works for the port of Palermo, Sicily, and a water-supply project for Athens, Greece.

Walter Townsend Smith (Affiliate '08) retired engineer of Summit, N.J., died at his home there on August 5. His age was 73. Mr. Smith had been construction superintendent for the New York architectural firm of Halsey, McCormack & Helmer and the William Kennedy Construction Co., of Brooklyn, N.Y. He supervised the construction of the Hotel McAlpin in New York, the Williamsburgh Savings Bank in Brooklyn, and many other structures in the metropolitan area.

Joseph Francis Still (M. '26) of West Chicago, Ill., died on August 12, 1945, according to word just received at Society Headquarters. Mr. Still, who was 60, had been assistant subway engineer for the Chicago Bureau of Subways and chief engineer in charge of sewage disposal and waterworks for Charles DeLeuw & Co., of Chicago. More recently he was special valuation engineer for the Illinois Commerce Commission, and supervising engineer for the Chicago firm of Battey & Childs.

Arthur Appleton Young (Assoc. M. '22) irrigation engineer in the Division of Irrigation of the U.S. Department of Agriculture, Pomona, Calif., died at his home there on July 8. Mr. Young, who was 67, had been engaged in research for the Department of Agriculture since 1926. Before that he was with the Canadian Pacific Railway and the Butte (Mont.) Water Co. He was the author of numerous papers on irrigation and water-supply subjects, and had prepared several technical bulletins for the state and the Department of Agriculture.

◆

Palestine's Jordan River Valley Plan Emulates TVA

(*Continued from page 29*)

Sea with a head of about 360 ft. Just before reaching the cliffs on the west side of the Dead Sea, a pool would be constructed for regulation of the flow to the power plant there.

Jordan Would Lose 946,000,000 Cu M

The amount of water to be diverted from the Jordan River for irrigation would be about 946,000,000 cu m per year, or 1,060 cfs. The first plant on Abu Sidra, operating on a straight-time basis, 24 hours a day, would have a capacity of about 65,000 kw and the Dead Sea plant about 25,000 kw. Allowing for 50 percent load factor, the installed capacities would be about 100,000 kw and 37,500 kw, respectively.

The full output of power mentioned can only be generated after complete development of all the stages of irrigation that take water from the Jordan River and its tributaries. A partial diversion of water for irrigation would allow only a proportionate generation of power if the level of the Dead Sea is to remain about normal.

The total estimated cost for the irrigation and power projects is about $250,000,000. The average cost per acre would be about $316.50, with the average annual cost to the farmer about $22.40 per acre, or 1.71 Palestine mils per cu m. At present Palestine farmers are paying generally within a range of from 3 to 4 Palestine mils per cu m. The unit cost of power at the switchboard would be about 3.85 U.S. mils. (a U.S. mil is one quarter of a Palestine mil).

It is proposed that all engineering works be of the most modern and permanent design and that the canals and tunnels be lined with concrete. The distribution system, taking water from main canals or laterals, would utilize concrete-lined canals or steel pipes as local conditions dictated. The final distribution generally would be through a closed system of steel pipes.

The guiding principle of the project is that no drop of water should be allowed to run to waste. Plans therefore call for the building of many dams and reservoirs of varying sizes and a network of concrete-lined irrigation canals covering the country. The main feeder canals, excluding laterals, would have an aggregate length of approximately 450 miles. Over 25 dams would be required, ranging in height up to 500 ft. Three of the larger dams would be from 80 to 300 ft in height and from 1,200 to 8,500 ft in length.

Power is especially valuable so close to the Dead Sea because the heavy brine of that inland sea forms an inexhaustible deposit of potash (used for fertilizers), bromine (for oil refineries) and magnesium (for alloys utilized in airplane construction). These resources already have been tapped, but with more power available, industrial utilization of the Dead Sea can be increased by leaps and bounds.

The work of the JVA would include soil erosion control, soil improvement, flood control, range management and reforestation.

Benefits of this proposed multiple-purpose development should be far-reaching, particularly in view of the unusual combination of good soil, a California climate, an ample water supply and waterpower resources sufficient to insure a suitable balance between industrial and agricultural developments. It is believed that the JVA ultimately will provide farms and industrial possibilities capable of supporting an additional population of two to three million.

Just as the Tennessee Valley Authority has become the model for water conservation and reclamation projects throughout our country, so too it is conceivable that the Jordan Valley Authority when consummated would become a model for similar projects in the entire Middle East, thereby promoting the social and economic welfare of all the region's inhabitants.

◆

Economic Justification of Arizona Highway Improvements

(*Continued from page 25*)

shortest present route is 125 miles and serves several communities between these two cities. Traffic on this route is fast approaching the point where better highway facilities will be necessary.

The problem is, where shall we build and to what future requirement shall we plan? The terrain between Phoenix and Tucson presents no problem as far as location is concerned. All communities could be by-passed and almost a straight line could be established for the entire distance. The only real topographical controls

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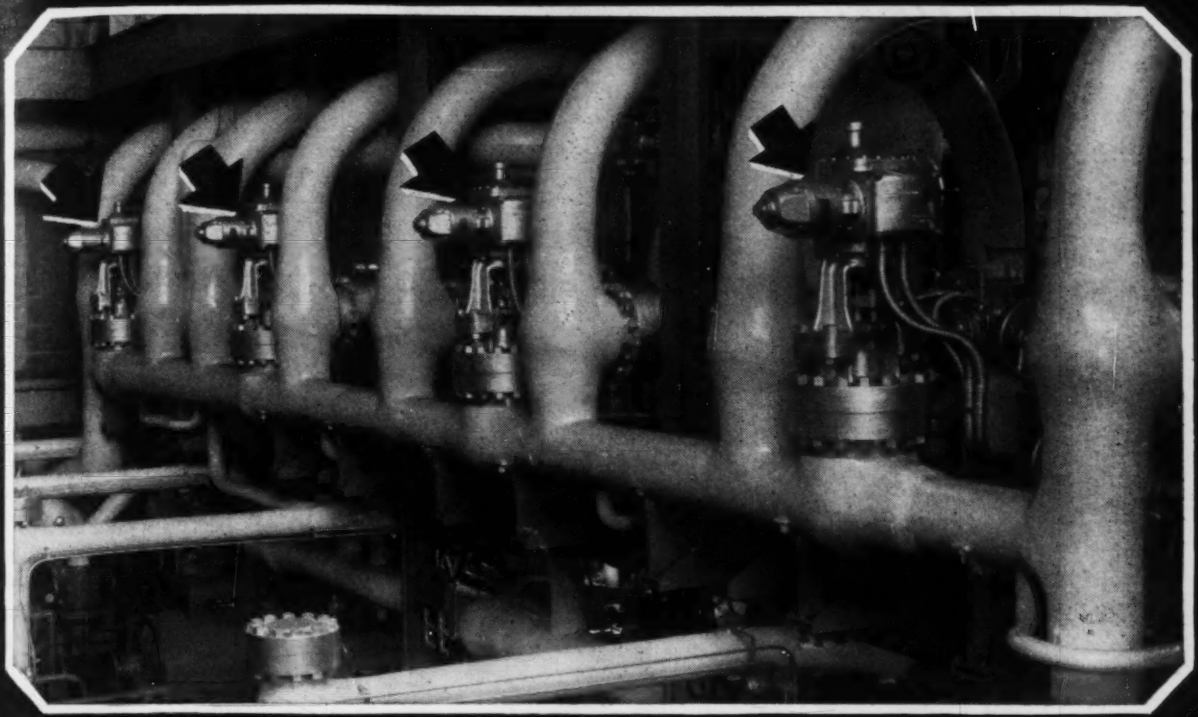

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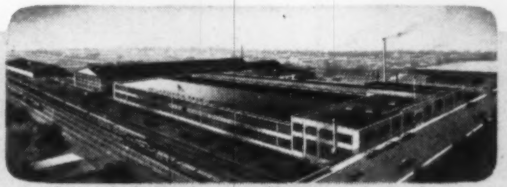

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are the Sacaton Mountains and the Picacho Mountains. With slight curvature these would be missed. The shortest possible route would be about 110 miles, a saving of only 15 miles as compared with the present shortest route.

Origin, Destination Study

An origin and destination survey along this route is being conducted to determine the type of traffic, where it is coming from and going to, the volume, tonnage, and type of commodities hauled. From the data gathered in this survey we hope to determine: (1) Adequacy of the present roads; (2) necessary service to communities; (3) is a new route necessary; (4) if so, how much traffic will it generate; (5) should it be "limited access"; (6) if so, where should interchanges be placed; (7) best location to serve the most; and (8) cost analysis.

It is hoped that one route can be isolated as the preference from the standpoint of benefits to the road user as well as from that of economics of construction and maintenance.

The Arizona planning survey division is also completing an origin and destination survey in the metropolitan area of Phoenix, to supplement a report made two years ago. The survey is receiving the cooperation of the city of Phoenix, Maricopa County, and the Public Roads Administration, and has 100 percent public support.

From an analysis of these reports it is hoped that an arterial system of city streets into and through Phoenix will be laid out to unite with a like system of county and state arterials. Since the main state highway routes through Phoenix are east and west, it is planned to project at least one east-west route through the city on a freeway or limited-access basis.

◆

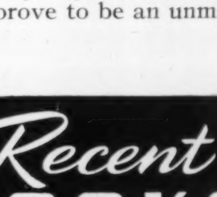
Stream Pollution Abatement Needs Economic Justification

(*Continued from page 41*)

more promising than those which will preserve and restore the land through the wise control and use of the waters from the heavens. They transform the curse of floods into the blessings of a plentiful supply of life-giving water. They stop the waste of erosion and start the rebuilding of the soil. They attract industry. They transform ugliness into beauty and cause a bountiful nature to smile again. They make it possible for us and—more important—for our children and for their children to live a good and happy life at home on the banks of the pleasant streams of Hoosierland."[8]

If such projects can attain this goal wisely, justly, and economically, they will prove to be an unmitigated blessing.

Recent BOOKS



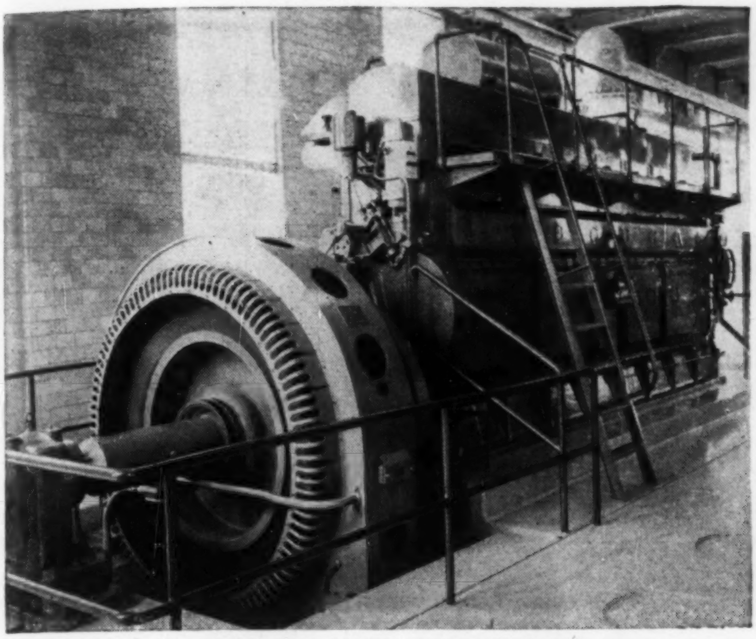
CONTRACTS IN ENGINEERING, 4 ed. By J. I. Tucker. McGraw-Hill Book Co., New York and London, 1947. 341 pp., tables, $8^1/_2 \times 5^1/_4$ in., cloth, $5. This textbook of legal principles for students, engineers, contractors, and businessmen covers the interpretation and writing of engineering-commercial agreements. The object of the book is to explain the fundamentals underlying a variety of cases and situations so that the guiding principles will be recognizable. A detailed index and several groups of study

(*Continued on page 81*)

NEWS

FROM THE PUBLIC WORKS FRONT

AS REPORTED BY THE DEVELOPMENT ENGINEERS, FIELD SERVICE REPRESENTATIVES AND CUSTOMERS OF WORTHINGTON



Type SEHGO-8 supercharged Worthington Dual-Fuel Diesel engine

Supercharged Dual-Fuel Diesel Goes Into Service— Over 36% Thermal Efficiency

What can be accomplished by supercharging a dual-fuel Diesel has been demonstrated by the performance of the new Worthington engine in the municipal power plant at Lamar, Colo.

This 1530 hp engine, recently installed to drive a 1080 kw generator, has turned in a record of over 36% thermal efficiency—7050 net btu per brake horsepower hour (total of gas and pilot oil fuels) at full load. Elevation at 3600 ft.

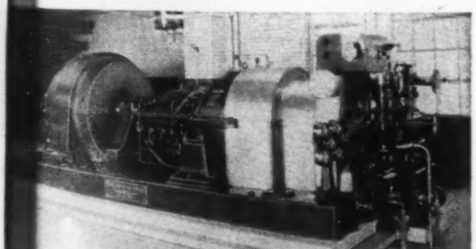
Worthington achievements in producing the first U. S.-built 4-cycle dual-fuel engine and the world's first supercharged engine of this type were among the reasons why Lamar selected Worthington equipment, to take care of its greatly increased demand.

The Worthington engine at Lamar uses natural gas on the Diesel cycle, but in case of gas line failure, it is quickly convertible (by a turn of a wheel) to Diesel oil or any mixture of gas and oil. With gas, the fuel cost is slightly more than one mill per kw.

The supercharger utilizes the energy of the engine exhaust to drive a blower which supercharges the engine. In addition to increasing horsepower about 50%, this improves mechanical efficiency and scavenging, resulting in lower fuel consumption. Lubricating oil requirements are also reduced. Further economies result from the lower installation cost: less building space, smaller foundations, etc.

Activity in the Lamar territory has increased so much in the past six years that the power plant has been hard pressed to keep its customers supplied. Construction of a new dam a few years ago doubled the load, and the expansion of the local milling industry further increased the load so that Lamar needs, today, three times the power it used in 1940 (and 18 times the power used in 1921).

The new generating unit is being used for peak loads and standby services.



Worthington 500 KW turbine at New York's Dept. of Sanitation Incinerator Plant on 56th Street.

The Incinerator on 56th Street

New York City maintains an incinerator plant on 56th Street. This plant uses the heat generated in burning refuse to make power for operating cranes, lights, plant auxiliaries.

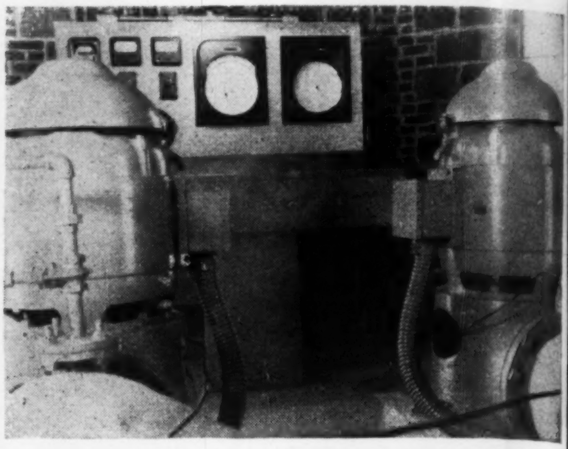
Two Worthington 500 KW alternating current geared turbine-generator units supply the power. They were installed in 1936. They operate on steam at 200 lbs. pressure supplied from the waste heat boiler and exhaust at 5 lb. back pressure.

1

WORTHINGTON PUMP AND MACHINERY CORPORATION, HARRISON, N. J.

NEWS from the public works front

Worthington Helps Ranney System at American Cyanamid



Two Worthington turbine pumps in American Cyanamid Company pump house.

American Cyanamid Company's new plant in Wallingford, Conn., is located on sandy flats.

One of the principal problems was to find a suitable source of process water. The plant being located in a valley, it was presumed that enough ground water would be available. But after six wells had been placed in operation, it was found that the geological formation was such that the water supply dwindled, leaving no reserve for plant expansion.

A survey of subterranean water sources was made by an experienced geologist who disclosed that a valuable aquifer existed on the property. One of the latest types of water collecting system, designed by the Ranney Water Collector Corporation, was installed.

Worthington In the Pumping Station

The system works this way. 1, A large area of water-bearing formation is exposed to horizontal screen pipes located below the ground water table. 2, Selective removal of the fine material from the aquifer in the vicinity of the screens and the formation of more permeable ground or a gravel pack adjacent to the screen produce a series of radiating drainage canals emptying into a central shaft. 3, The lines lead to portholes in the lower section of a concrete cylinder, sealed at the bottom.

This compact unit is capable of producing, for American Cyanamid Company, 5 million gpd. The water is colorless, odorless, tasteless and bacteria-free due to the large infiltration area and the 80-ft depth of sand and gravel through which it travels to the pipes.

Two Worthington turbine pumps were selected for the pumping station. Each has a capacity of 100 gpm. The flexibility provided by the Worthington design is ideal because added capacity can be obtained from each pump at moderate additional cost.

Water from the caisson bottom is pumped to a tank above ground to feed two Worthington centrifugal Monobloc pressure pumps supplying the plant pressure system.

Operation of the water system is entirely automatic. The well pumps are controlled by the water level through contact electrodes in the above-ground supply tank, and the pressure system is controlled by live pressure.

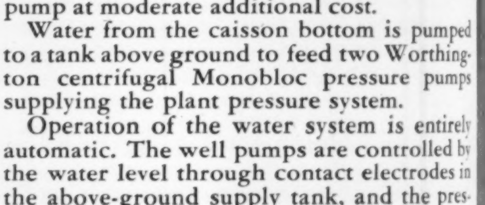
Unusual Design of 3-Stage Pumping

Back in 1928, the South Pittsburgh Water Company installed an unusual Worthington pumping unit for 12 mgd against 370 ft TDH at 1140 rpm. Its success led to installation of a second unit in 1933 for 13 mgd against 370 ft TDH at 1140 rpm. (A third unit for similar service is now under construction.)

These pumping units are really "three stage". The first stage units are 18 in. Worthington motor-driven pumps located in the basement within reach of the water in suction wells. Power for first stage pump motors is furnished from generators on the main floor, forming a part of the pumping units.

The two main pumping units are on the engine room floor. They each consist of steam turbines direct-connected to generators and two 18 in. Worthington pumps in series.

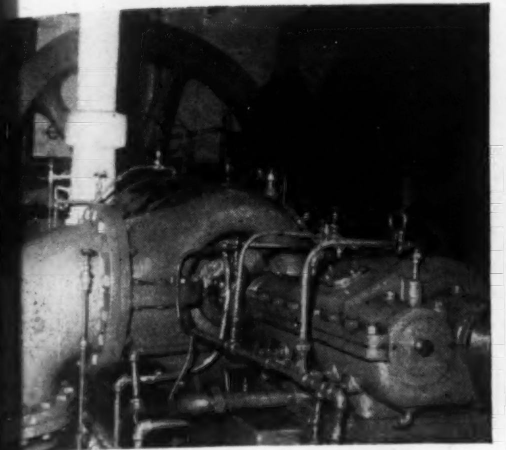
Power developed by the generators is also used for motor-driven pumps at another station.



15 mgd Worthington Centrifugal pumping unit and 2,000 kw gen South Pittsburgh Water Company

public works NEWS

Worthington
Pump and
Machinery
Corporation
•
Harrison, N. J.



Worthington-Moore Steam Turbine driving two centrifugal pumps. Old Worthington steam engine shown in background.

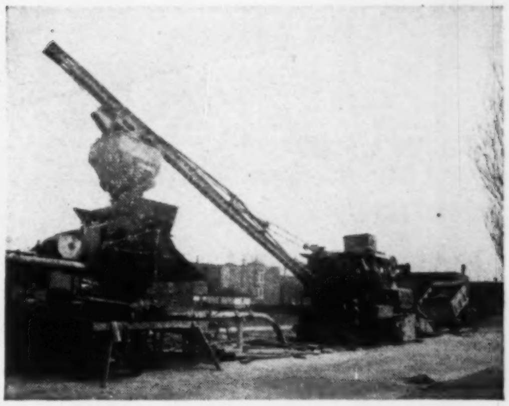
More Power from Smaller Packages Experienced at Canoe Brook

The extent of engineering progress in pumping station equipment is dramatically illustrated by installations of Worthington equipment at the Commonwealth Water Company's Canoe Brook Pumping Station in Summit, New Jersey. This company, an affiliate of the American Water Works and Electric Company Inc., supplies water to the municipalities and 13 communities in that part of New Jersey, and the Canoe Brook Station is one of three pumping stations.

One of the biggest pieces of equipment is a Worthington compound crosshead steam engine and displacement pump installed in 1924. t has a daily capacity of 6,000,000 gallons and is still performing with complete satis-action. It takes up 50 ft by 25 ft and the flywheel alone weighs 75 tons.

By comparison, the Worthington-Moore urbine recently installed to drive two cen-rifugal pumps with a total capacity of 5,000,000 gpd, requires much less floor space—the otal equipment occupies less than one-tenth he space, but has five-sixths the capacity of he older engine and pump.

Improved simplicity is demonstrated by the urbine combination in which all valves and nkages have been eliminated. With the ex-ception of the gear box, all of the elements contain only one moving part.



Ransome Blue Brute 34E Dual Drum Paver discharging into a batch hopper.

World's Record on Dual Drum Pavers

The ten Ransome Blue Brute Dual Drum Pavers owned by S. A. Healy Company of Chicago give this company what is believed to be the largest number of same-make dual drum pavers owned by a single company.

But none of those machines has ever been used as a paver!

Like the Ransome high-elevated-boom pavers used by the U. S. Government at the Grand Coulee Dam and by many private contractors for building construction work, these machines actually serve as mobile mixing plants.

The combination of fast hydraulically-controlled boom swing and hydraulically-controlled discharge bucket makes it possible to concrete isolated bridge piles and thin walls or to load trucks, batch hoppers, etc., without the dangerous working hazard of a man on top of the form or hopper.

The design gives a clearance of 20 ft. from bucket to ground at the outer end of the boom. The bucket has a self-leveling device and an automatic lock. If the bucket cable should break, the automatic lock holds the loaded bucket at any position on the boom, thus preventing the bucket from running down the boom and crashing into the mixer.

These Blue Brute machines are being used on such jobs as the Chicago Subway system, the Union Stock Yards sewers and the Neversink Dam at Luzon, N. Y.

57-Year-Old Pump Makes "Good Buy"

Worthington Pittsburgh office was recently asked to look up the records of a certain 12x7x10 duplex, piston-pattern, direct-acting pump. The inquirer said this pump was in excellent condition and that he could buy it for $450.00.

A search of the records revealed that that particular pump had been built in 1890!

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CONSTRUCTION MACHINERY

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MIXERS

(Continued from page 76)

and review questions add to the practical value of the book for self-study.

Engineering Organization and Methods. By J. E. Thompson. McGraw-Hill Book Co., New York and London, 1947. 337 pp., illus., diagrs., charts, tables, 9¼×6 in., cloth, $4. This book furnishes industrial executives and supervisors with tested techniques for speeding up production and reducing costs in product-design engineering departments. Offering a specific fundamental plan for organizing, operating and controlling these departments, it describes practical methods that have been used successfully in both large and small engineering sections of a wide variety of technical concerns. The book supplies the complete data necessary for the orderly preparation, processing and recording of engineering information, and also includes a useful, general discussion of the functions of supporting departments.

Hot-Water Heating and Radiant Heating and Radiant Cooling. By F. E. Giesecke, New Braunfels, Texas. Apply to author or Technical Book Co., Austin (110 E. 9th St., P.O. Box 62), Tex. 283 pp., illus., diagrs., charts, tables, 9¼×6 in., cloth, $4. This practical work is chiefly concerned with actual design and installation procedures for particular types and cases of hot-water heating, radiant heating and radiant cooling. All necessary graphs and calculations are included. Separate chapters are devoted to the heat requirements of buildings, heat emission of radiators, panels, etc., distinctions between open and closed systems, district heating, and radiant heating and cooling fundamentals.

Law for Engineers and Architects, 3 ed. By L. P. Simpson and E. R. Dillavou. By L. P. Simpson. West Publishing Co., St. Paul (Minn.), 1946. 855 pp., 9¼×5¾ in., cloth, $5. The method of presentation used in this text is to state the fundamental principles of law in those branches that bear most directly upon the engineering profession and to illustrate these principles, where space permits, with cases in which an engineer, builder, architect, or owner are involved as parties. The new edition includes some 70 new cases, most of which were decided after 1941. Particular emphasis has been given to the law of contracts, with separate chapters devoted to its various elements. Standard forms of contracts and agreements are appended.

(The) Rammed-Earth House. By A. F. Merian, Harper & Brothers Publishers, New York and London, 1947. 230 pp., illus., diagrs., 8¼ × 5½ in., cloth, $2.50. The rammed-earth or "pisé" type of construction has been known and used for centuries. The author presents it as particularly suited to low-cost housing, and describes the construction methods from the foundation to the finished building. He discusses the selection of material, faults that can be avoided, useful variations such as soil-cement, and surfacing techniques. Design features are presented for both interiors and exteriors.

Writing the Technical Report. By J. Raleigh Nelson. McGraw-Hill Book Co., New York and London, 1947. 388 pp., diagrs., 9 × 5¾ in. cloth, $3. Emphasizing the design of the report as a structure for service, this book develops fundamental principles involved in writing the report for designated readers and a definite purpose instead of stressing the incidentals of form. Also included are specific directions for the setup of the report, a systematic procedure for its critical examination, and a series of assignments for classroom use.

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APPLICATIONS FOR ADMISSION OR TRANSFER

September 1, 1947

Number 9

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every Member is urged, therefore, to scan carefully the list of candidates published each month in Civil Engineering *and to furnish the Board with data which may aid it in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board. Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

Grade	General Requirement	Age	Length of Active Practice	Responsible Charge of Work
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years
Associate Member	Qualified to direct work	27 years	8 years	1 year
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to co-operate with engineers	35 years	12 years	5 years

APPLYING FOR MEMBER

Baird, Charles Oscar, Jr. (Assoc. M.) (Age 46) Assoc. Prof. of Civ. Eng., Northeastern Univ., Boston, Mass.

Boris, George Serge (Age 44) Civ. Engr., Dept. of Works and Housing, Sydney, Australia.

Chatterjee, Bimal Nath (Assoc. M.) (Age 54) Deputy Chf. Engr., Calcutta Port Commrs., Calcutta, India.

Colbert, William Emmett (Assoc. M.) (Age 44) Civilian Res. Engr. for U.S. Army, 25th Div. Artillery, Nara, Houshu, Japan.

Comly, Harry Seykora (Assoc. M.) (Age 60) Dist. Maintenance Engr., California Highways Dist. XI, San Diego, Calif.

Crowe, George Frederick (Age 39) Chf., Design Sec., U.S. Engr. Office, Norfolk, Va.

Davis, Paul Dexter (Assoc. M.) (Age 56) Member of firm, Piatt & Davis, Cons. Engrs., Durham, N.C.

Dewell, Robert Dievendorf (Assoc. M.) (Age 37) Civ. and Structural Engr. (private practice), San Francisco, Calif.

Dietz Olen Adolph (Assoc. M.) (Age 40) Asst. Southern Dist. Engr., Municipal Eng. Div., Panama Canal, Balboa Heights, Canal Zone.

Duffill, Hugh Perrins (Assoc. M.) (Age 49) Cons. Engr., Boston, Mass.

Gee, Herbert Caran (Age 36) Commanding Officer, Atomic Comm., Los Alomos, N.Mex.

Goodrich, James Lynn (Age 42) Power Consultant, Ashley G. Classen & Associates, Cons. Engrs., El Paso, Tex.

Grimes, James Henry (Age 54) Chf. Engr., Puerto Rico Transportation Authority, San Juan, Puerto Rico.

Harris, Mark Leroy (Assoc. M.) (Age 51) Member of firm, Jensen, Bowen & Farrell, Engrs., Ann Arbor, Mich.

Howard, Ralph Strong (Age 63) Engr., U.S.E.D., Savannah, Ga.

Hunt, Glenn Curtis (Age 42) Member of firm, Mitchell & Hunt, Cons. Engrs., San Antonio, Tex.

Jemian, Simon Calousd (Assoc. M.) (Age 54) Structural Engr., U.S. Engr. Office, Washington, D.C.

McHenry, Douglas (Age 44) Head, Structural Research Sec., U.S. Bureau of Reclamation, Denver, Colo.

Middleton, Paul Edward (Age 51) Chf. Staff Planner with Lawrence V. Sheridan, Consultant on City and Regional Planning, Indianapolis, Ind.

Pinney, Jabez Preston (Assoc. M.) (Age 68) Structural Engr., San Francisco Public Utilities Comm., San Francisco, Calif.

Raghavachary, Kizhanatham Sudarsana (Age 52) Deputy Cons. Engr., Transport Dept., New Delhi, India.

Sawyer, William Lincoln (Assoc. M.) (Age 42) Prof. of Civ. Eng., Univ. of Florida, Gainesville, Fla.

Schegolkov, Victor K. (Assoc. M.) (Age 45) Chf. Engr., Structural Dept., Isaacson Iron Works, Seattle, Wash.

Seybold, John States (Age 50) Dist. Engr., Baltimore Dist., Corps of Engrs., Baltimore, Md.

Smith, Edward Ephraim (Assoc. M.) (Age 56) Gen. Supt., Dept. of Water & Sewage Treatment, Lima, Ohio.

Spitzer, Felix Henry (Assoc. M.) (Age 69) Acting Chief Structural Engr., Dept. of Public Works, Bureau of Bldg. Inspection, San Francisco, Calif.

Sweet, Charles Leroy (Age 46) Acting Chief, Div. of Irrigation Operations, U.S. Bureau of Reclamation, Boulder City, Nev.

Titus, Ernest Moulton (Assoc. M.) (Age 47) Civ. Engr. V (Structural), TVA, Knoxville, Tenn.

Vredenburg, Paul Lawrence (Age 43) Engr. Consultant, Joint Army-Navy Board, Berkeley, Calif.

Wood, James Robert (Age 60) City Engr., Calgary, Alta, Canada.

APPLYING FOR ASSOCIATE MEMBER

Ager, John Walter Albert (Age 32) Design Engr., with Richard Costain, Ltd., Civ. Eng. Contrs., London, England.

Agnew, Robert Andrew (Age 31) Senior Asst. Engr. (Roads), Town Engineer's Dept., Transvaal, South Africa.

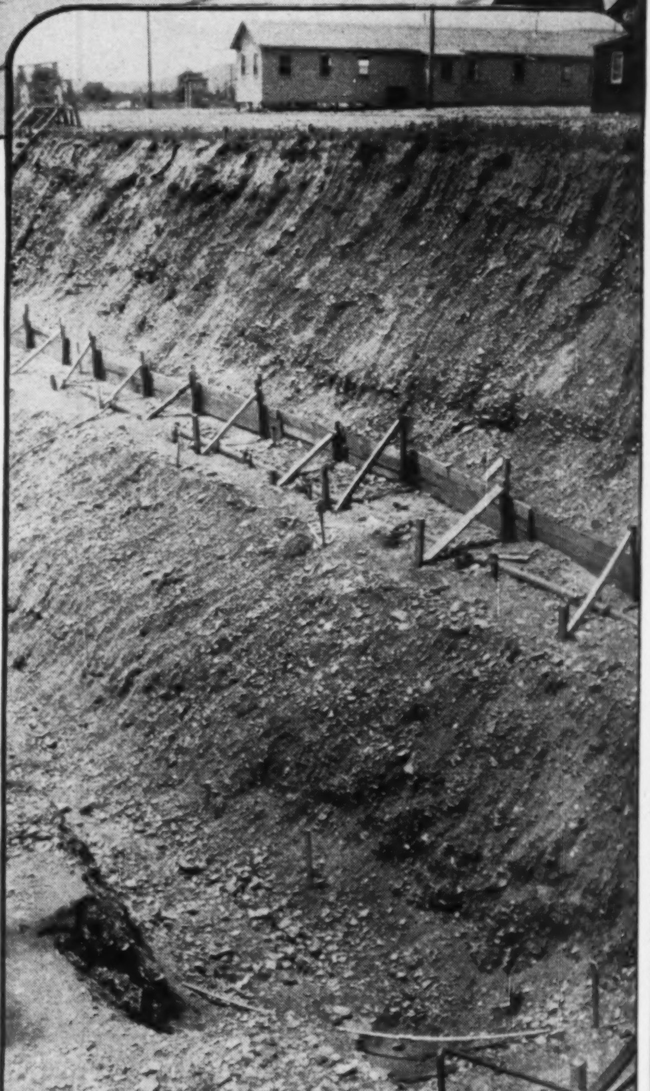
Ahmed, Iftekhar (Age 29) With Bureau of Reclamation, Denver, Colo.

Billups, Benjamin Edward (Age 34) Civ. Engr. (P-3), Ballistics Research Laboratory, W.S.P.G., Las Cruces, N.Mex.

(Continued on page 84)

BONE DRY

with a river at the door!



Note the sloped banks—
and the gravelly soil conditions

CONTRACT PUMPING is the answer to the problem of handling a wet job well—and economically.

For a specified sum, AMERICAN DEWATERING CORPORATION, using Moretrench Wellpoint Equipment, is keeping twenty feet of water under control on the power plant foundation shown above.

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Bowling Green 9-4749
HOUSTON CHICAGO TAMPA

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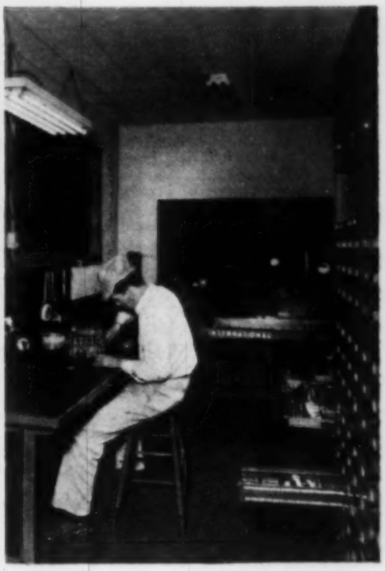
International distributors maintain complete stocks of parts under a perpetual inventory control. This, plus nearby International parts depots, assures prompt supply of any needed part.



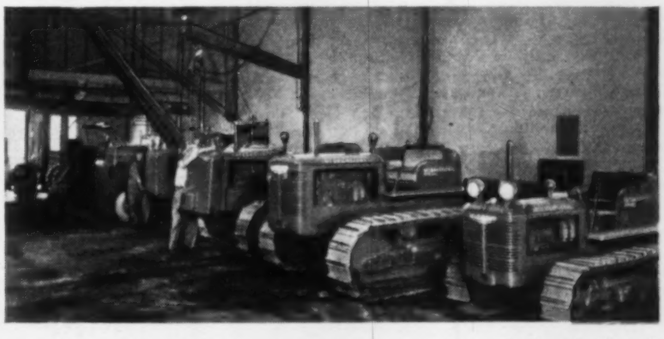
Dust-proof rooms are used for cleanliness in handling precise work on Diesel fuel systems.

NATION-WIDE SERVICE and PARTS FACILITIES keep INTERNATIONAL Power at peak efficiency

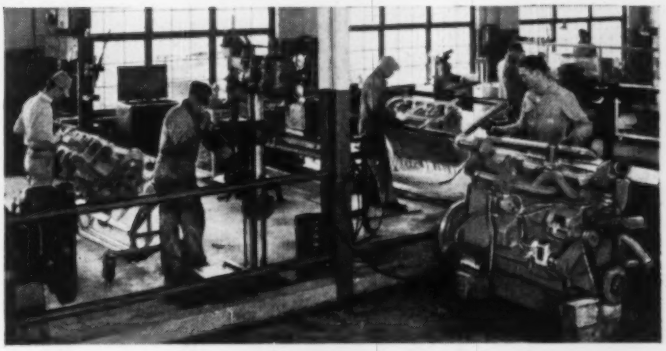
International Industrial Power Distributors throughout the nation are superbly equipped to service and maintain International tractors and International-powered equipment.

Keeping "down time" to a minimum is the function of this nation-wide parts and service network—so that Internationals may produce better profits for their owners through greater dependability and longer operating life.

Depend on your International Industrial Distributor for your equipment and service requirements.

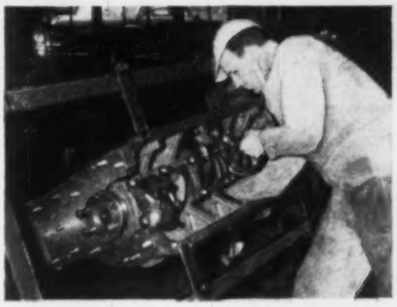


Equipment mounting is done under ideal circumstances as in the distributor's storage building shown here.



Factory-trained mechanics, using modern fixtures and tools, make sure of factory-level servicing, repairing and rebuilding of International engines. The engine department of a distributor's shop is shown above.

Up-to-the-minute fixtures speed up engine work.



Industrial Power Division
INTERNATIONAL HARVESTER CO.
180 North Michigan Ave., Chicago 1, Illinois

INTERNATIONAL POWER

CRAWLER AND WHEEL TRACTORS • DIESEL ENGINES • POWER UNITS

(Continued from page 81)

Boemi, Anthony Andrew (Jun.) (Age 32) Asst. Vice-Pres., (second in command), Loan Dept., First Federal Savings, Chicago, Ill.

Brown, Louis Alexander, Jr. (Age 38) Res. Engr., North Carolina Highway Comm., Charlotte, N.C.

Byrne, William Eugene (Age 56) Civ. Eng. Associate, Bureau of Eng., Los Angeles, Calif.

Carrillo-Batalla, Francisco (Age 31) Cons. Engr., Banco Obrero of Venezuela.

Chacko, Illiparampil George (Age 28) Asst. Executive Engr., Port Trust, Calcutta, India.

Chatterjee, Ranjit Mohan (Age 30) Permanent Eng. Asst. (Sectional Officer), Calcutta Port, Calcutta, India.

Clark, Robert Taylor (Jun.) (Age 27) Office Engr., Office of Carl W. Clark, Architect, Cortland, N.Y.

Clinger, Charles Burke (Jun.) (Age 29) Constr. Engr., Cole Manes & Co., Dallas, Tex.

Cooper, Alfred Joseph, Jr. (Jun.) (Age 34) Hydr. Engr., Forecasting Sec., Knoxville, Tenn.

Cranford, Elmo Leavines (Age 44) Engr., Peter Kiewit Sons Co., Arcadia, Calif.

Crumlish, William Samuel (Jun.) (Age 28) Capt., Corps of Engrs., U.S. Army (Regular), Ft. Belvoir, Va.

Dorfman, Joseph Samuel (Jun.) (Age 31) Associate Structural Engr., Dept. of Water & Power, Los Angeles, Calif.

Downe, Charles Edward (Jun.) (Age 35) City Plan Engr., New Haven, Conn.

Duke, Charles Martin (Jun.) (Age 29) Senior Testing Engr., Pacific Islands Engrs., Guam, Los Angeles, Calif.

Earl, Thomas Collins (Age 32) Supt. of Water System, and Secy., Industrial & Domestic Water Supply Comm., Savannah, Ga.

Edson, Charles Grant (Age 30) Asst. Prof. of Civ. Eng., Univ. of Florida, Gainesville, Fla.

Faller, Vincent Augustus (Jun.) (Age 34) Asst. Design Engr., J. E. Greiner Co., Baltimore, Md.

Fox, John Clayton (Jun.) (Age 28) Gen. Bldg. Contr., Escondido, Calif.

Frey, Walter Francis (Age 36) Airport Engr. Engr. (Review) P-3, CAA, Big Spring, Tex.

Halff, Albert Henry (Jun.) (Age 32) Asst. Prof. of Civ. Eng., Southern Methodist Univ., Dallas, Tex.

Hargett, Hayden McKinsen (Age 31) Res. Engr., Alabama Highway Dept., Russellville, Ala.

Herrick, Harold Colton, Jr. (Age 30) Civ. Engr., U.S. Dept. of State, Alexandria, Va.

Hess, William Joseph (Age 35) Plant Inspector, American Can Co., Los Angeles, Calif.

Hodson, Verne J. (Age 37) Structural Engr., Corn Products Refining Co., Chicago, Ill.

Huge, August William (Age 32) Designer and Draftsman, Gen. Foods Corp., New York City.

Johnson, Joseph Hartwell (Jun.) (Age 33) Engr. with Paul W. Trousdale, Los Angeles, Calif.

Krashen, Harry (Age 37) Indiana Highway Comm., Dept. of Bridge Constr., West Lafayette, Ind.

Leyenberger, Lawrence Alden (Jun.) (Age 34) Hydr. Engr., Parsons, Brinckerhoff, Hogan & Macdonald, Cali, Colombia.

Lively, Tom George (Age 30) With Consoer, Townsend & Associates, Chicago, Ill.

Lucas, Kenneth Barrett (Age 35) Frankfort, Kans.

McKinley, Rex Vincent (Age 33) Engr. P-4, Special Eng. Div., Panama Canal, Diablo Heights, Canal Zone.

Martin, Sylvan Cuyler (Age 38) Senior San. Engr., Operation Sec., San. Water Board and State Dept. Public Health, Springfield, Ill.

Merchant, Wilfred (Age 35) Lecturer in Structural Eng., Coll. of Tech., Manchester, England; Lancashire, England.

Murphy, John Alfred (Age 43) Project Engr., FWA, Chicago, Ill.

Nowakowski, Edward (Jun.) (Age 33) Mech. Engr., TVA, Fountain City, Tenn.

Okkerse, John Bertram (Jun.) (Age 35) Asst. to Executive Vice-Pres., Santa Catalina Island Co., Avalon, Calif.

Ospina, Carlos Sebastian (Jun.) (Age 27) Asst. Project Engr., Parsons, Brinckerhoff, Hogan & Macdonald, Cali, Colombia.

Ponder, Daniel Roy (Age 39) Mayor, El Paso, Tex.

Ramey, John Kimbrough (Jun.) City Engr., Oxford, Miss.

Sanders, Wilbur Hale (Age 29) Engr. (Civ.), Office of Dist. Engr., Corps of Engrs., Jacksonville, Fla.

Simpson, Chauncey Olcott (Age 45) Div. Plans & Survey Engr., Delaware Highway Dept., Wilmington, Del.

Sorensen, Wendell Chris (Age 38) Engr. with Edward F. Neild & D. A. Somdal, Shreveport, La.

Vogle, Theodore Jones (Age 37) Asst. Res. Engr., Corps of Engrs., Wister Dam, Okla, Poteau, Okla.

Waitt, Robert Graham (Age 28) Lt.-Col., Corps of Engrs., Regular Army, Atlanta, Ga.

Weaver, Donald Gale (Age 38) Staff Technician, Southern California Gas Co., Huntington Park, Calif.

Webster, Edwin Henry (Age 29) Supervisor, Structural Eng. Sec., Airport and Bldgs. Div., American Airlines, Hulmeville, Pa.

APPLYING FOR JUNIOR

Balasubrahmanyam, Sundaresan (Age 24) Engr., design and plans for Ramapadasagar Dam, Madras PWD, India; Office of International Eng. Co., Inc., Denver, Colo.

Cooke-Yarborough, Steven Sandford (Age 28) Asst. Soils & Foundation Engr., Knappen Eng. Co., New York City.

Culbertson, Don Max (Age 30) Hydr. Engr., U. S. Geological Survey, Norton, Kans.

Demers, Thomas Martin (Age 26) Cost Engr., Ebasco Services, Sunbury, Pa.

Johnston, Wallace Dean (Age 23) Airways Engr., Eng. Sec., CAA, Regional Office, Honolulu, Hawaii.

Nixon, Walter Timothy (Age 28) Structural Engr., Austin Co., Cleveland, Ohio.

Pappas, Harry, Jr. (Age 27) Eng. Aide III, Los Angeles County Road Dept., Long Beach, Calif.

Raju, Dandu Sanjeeva (Age 24) Supervisor, Designs & Tests Div., Ramapadasagar Dam, International Eng. Co., Inc., Denver, Colo.

Rao, Prattipati Visweswara (Age 24) Supervisor, Madras PWD, Designs & Tests Div., Ramapadasagar Dam, International Eng. Co., Denver, Colo.

Rao, Ramadenu Chandrasekara (Age 24) With International Eng. Co., Denver, Colo., on plans and designs for Ramapadasagar Dam, PWD, India.

Seshadri, Arumbakkam (Age 28) Supervisor, Designs and Tests Div., Ramapadasagar Dam, Madras, India; International Eng. Co., Denver, Colo.

	Age
UNIV. OF ARIZ.	
Wickes, Richard Gordon, 1947	(24)
BROOKLYN POL. INST.	
Stewart, Matthew William, 1947	(25)
BROWN UNIV.	
Kernitz, Charles Albin, 1947	(21)
THE CITADEL	
Hillen, Walter Reed, Jr., 1947	(22)
UNIV. OF COLO.	
Ash, Robert B., 1947	(27)
Burns, Jack Sharples, 1947	(20)
Dungan, Kenneth Rogers, 1947	(21)
Dunn, Louis Edwin, 1947	(21)
Gassman, Walter Francis, 1947	(23)
Johnson, Thaddeus Carroll, 1947	(20)
Orcutt, Robert Raymond, 1947	(25)
Price, James Loyd, 1947	(23)
Schwarz, Edith May Varian, 1947	(28)
Shapiro, Robert Joseph, 1947	(20)
Thomas, Wesley Adrian, 1947	(24)
Weber, Harry Albert, 1947	(29)
Wright, Louis Dean, 1947	(21)
COLUMBIA UNIV.	
Elliott, Alvin Herbert, 1947	(20)
Golden, John Bernard, Jr., 1947	(22)
UNIV. OF CONN.	
Stephens, Jack Edward, 1947	(24)
COOPER UNION	
Upton, Francis Joseph, 1947	(31)
CORNELL UNIV.	
Dixon, George Francis, Jr., 1947	(29)
Finch, Joseph Warren, 1947	(24)
Goldstein, Alfred Robert, 1947	(22)
DARTMOUTH COLL.	
Candler, Thomas Edward, 1947	(24)
Wade, George Harrison, 1947	(25)
UNIV. OF DETROIT	
Sinelli, Andrew James, 1947	(26)
DREXEL INST. TECH.	
Hofstaedter, Gerard Francis, Jr., 1947	(20)
May, Philip Samuel, 1947	(27)
UNIV. OF FLA.	
Cappleman, Homer Leroy, Jr., 1947	(24)
Dawkins, Mather Emory, 1947	(25)
Lewis, Arthur Ellison, 1947	(25)
GEORGE WASHINGTON UNIV.	
Shalowitz, Erwin Emmanuel, 1947	(23)
HARVARD UNIV.	
Leland, George Havens, 1947	(21)
Maynard, Charles Dorsey, 1947	(28)
UNIV. OF IDAHO	
Olsen, Robert Norman, 1947	(22)
ILL. INST. TECH.	
Christensen, Martin Benton, 1947	(24)
UNIV. OF ILL.	
Kluksdal, Nils, 1947	(26)
Rehman, Mohammad Abdur, 1947	(25)
Sjunnesson, John Edward, 1947	(22)
IOWA STATE COLL.	
Berry, Frederick Dean, 1947	(27)
Hahn, Oscar Maximilian, 1947	(28)
Krumboltz, Mary Irene, 1947	(21)
Polchow, William Harry, 1947	(24)
KANS. STATE COLL.	
Orpin, Robert, 1947	(30)
UNIV. OF KANS.	
Kershner, Hugh Cleveland, Jr., 1947	(24)
UNIV. OF MAINE	
Brown, Walter Eastman, Jr., 1947	(27)
Champion, Herbert Russell, 1947	(22)
Colcord, Josiah Edward, Jr., 1947	(25)
Paquette, Armand Roger, 1947	(23)
Spiller, Philip Davis	(25)
MICH. COLL. OF MIN. & TECH.	
Bal, Joseph, 1947	(25)
Bleimeister, William Carl, 1947	(21)
McCall, John Thompson, 1947	(24)
Vander Klipp, Robert Earle, 1947	(26)
UNIV. OF MICH.	
Moody, Eugene Gordon, 1947	(22)
MONT. STATE COLL.	
Wilkins, Harry, Jr., 1947	(23)
UNIV. OF N.H.	
Sanders, Ralph Erlon, 1947	(26)
UNIV. OF NEV.	
Paglia, Lawrence Alexander, 1947	(25)
UNIV. OF N.MEX.	
Adams, Frederick Shields, 1947	(28
Baker, Darrell Francis, 1947	(21)
Zwoyer, Eugene Milton, 1947	(20)
COLL. OF CITY OF N.Y.	
Altneu, Herbert Nathan, 1947	(24)
Gershtenbleet, Leonard, 1947	(21)
Kowalsky, Norman 1947	(22)
Shapiro, Murray, 1947	(22)
Sherman, Robert, 1947	(25)
N.Y. UNIV.	
Ghook, Alexander, 1947	(24)
PA. STATE COLL.	
Jenkins, Raymond Earl, 1946	(25)
UNIV. OF PUERTO RICO	
Matta-Diaz, Jose Rafael, 1946	(24)
RENS. POL. INST.	
Saenger, Hans Peter, 1947	(25)
RICE INST.	
Nutting, William Franklin, 1947	(23)
ROSE POL. INST.	
Shannon, John Blair, 1947	(23)
S.DAK. STATE COLL.	
Jorgensen, Deane Lee, 1947	(23)
UNIV. OF S.CALIF.	
Crull, Charles Ray, 1947	(29
Gray, Robert Lawrence, 1947	(25
Harrison, Alfred Skinker, 1947	(20
Hoffman, John Axel, 1947	(27
Lane, Elliot Jerome, 1947	(22
Lortz, Charles Everett, 1947	(27
Wallace, James Windham, 1947	(21
Wempe, Albert Frederick, 1947	(29
West, Jack Alvin, 1947	(28

WHOOSH

and it's clean!

Yes, the powerful hole-cleaning ability of the Gardner-Denver S55 Sinker frees the deepest holes of cuttings—instantly! But that's only one reason this 55-pound Gardner-Denver drill is so popular. Powerful four-pawl, rifle bar rotation gives it greater drilling capacity—perfect balance makes it easy to handle. With its fast performance and air economy, users call it the most efficient 55-pound sinker on the market.

All Gardner-Denver products have *special features* which make them a better buy for construction work. For complete information about the products shown on this page, write Gardner-Denver Company, Quincy, Illinois.

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1 This Gardner-Denver B87 Paving Breaker has a new safety catch that works like a "safety" on a gun to prevent accidental opening of the throttle. Easily converted to a sheeting driver.

2 Here's a champion tamper for fast, mechanical, backfill compacting. It's easy to walk over the fill—the valve and exhaust won't freeze in cold, damp weather. An integral oil reservoir assures complete lubrication.

3 Where ground is rough and extreme portability a "must," use the Gardner-Denver Universal Drill Mounting. It's fully adjustable for down holes, toe holes or line drilling—it's light and easily moved.

SWARTHMORE COLL.

Kaiser, Calvin, Lewis, 1947	(22)
Smith, Donald Willits, 1947	(21)

AGRI. & MECH. COLL. OF TEX.

Hurst, Daniel Earl, 1947	(24)

UNIV. OF TEX.

Behrens, Paul Dudley, 1947	(24)
Bethell, William Decatur, 1947	(23)
Campbell, Robert Franklin, 1947	(25)
Collins, Robert Lewis, 1947	(22)
Emrich, William Julius, 1947	(21)
Greynald, Bertrand William, 1947	(24)
Heller, Jesse Elbert, 1947	(21)
Labelle, Francis Forrest, 1947	(24)
McLean, Salem Francis, 1947	(20)
Pomeroy, Eltweed George, 1947	(24)
Porter, Coy Melvin, 1947	(23)
Rainery, Louis Donald, 1947	(23)
Trent, Cecil Merle, Jr., 1947	(24)
Watkins, John Francis, 1947	(22)
Wipke, Robert Frederick, 1947	(21)

UNIV. OF TOLEDO

Alspach, John Robert, 1947	(27)
Shinavar, Ellsworth David, 1947	(21)

UNIV. OF UTAH

Bell, Robert Edmund, 1947	(25)
Gentzler, Richard Edwin, 1947	(27)
Roundtree, William Arthur, 1947	(25)
Woolley, Jedediah Foss, III, 1947	(23)

VA. POL. INST.

Poladian, Jacob Harry, Jr., 1947	(21)

WASH. STATE COLL.

Cole, Charles Allen, 1947	(24)

WASHINGTON UNIV.

Amoratis, Irma Elizabeth, 1947	(20)
Duba, John Gorman, 1947	(25)

W.VA. UNIV.

Bays, Grover Haynes, 1947	(24)

UNIV. OF WIS.

Johnson, Donald Burnell, 1947	(24)
Petschel, Arthur William, 1947	(27)
Skatrud, Harlan Victor, 1947	(27)

WORCESTER POL. INST.

Morawski, Teddy Joseph, 1947	(24)

UNIV. OF WYO.

Torres V., Luis Felipe, 1947	(28)

YALE UNIV.

Cruz, Lauro Manahan, 1947	(27)

The Board of Direction will consider the applications in this list not less than thirty days after the date of issue.

CHANGES IN MEMBERSHIP GRADES

ADDITIONS, TRANSFERS, REINSTATEMENTS, AND RESIGNATIONS

From July 10 to August 9, 1947

Additions to Membership

Albornoz-Plata, Eduardo (Jun. '47) 6-79 Calle 7, Bogota, Colombia, S.A.

Asensio, Manuel Jose (M. '46) Col., Corps of Engrs., U.S.A., Engr., Air Defense Command, Mitchel Field, N.Y.

Babcock, Richard Melvin (Assoc. M. '47) Public Health Engr., State Dept. of Health, 1008 Capitol Bldg. (Res., 1635 Cheyenne St.), Lincoln 2, Nebr.

Barlin, Muriel Estelle (Miss) (Jun. '47) Junior Engr., Frank D. McEnteer, 905 Goff Bldg. (Res., 338 Lee Ave.), Clarksburg, W.Va.

Barnes, Glen Edward (Jun. '47) Hydr. Engr. I, Tennessee Valley Authority, 701 Union Bldg. (Res., 517 East Hill Ave.), Knoxville, Tenn.

Basman, Sabahattin Ali (Assoc. M. '47) Structural and Civ. Engr., Care, Yeni Aydin Oteli, Sirkeci, Instanbal (Res., Care, Dr. Sefik Lutfi Basman, Unlu Cadde 11, Bursa), Turkey.

Bateman, William Herbert (M. '47) Prin. Senior Partner, W. Herbert Bateman and Partners, 167 Victoria St., Westminster, London, S.W.I., England.

Beard, Vernon Miller (Jun. '47) Eng. Draftsman, Naval Ordnance Laboratory, Bldg. 210, Washington, D.C. (Res., Route 1, Finksburg, Md.)

Bedford, Thomas Archibald, Jr. (M. '47) Gen. Mgr., Kaiser-Frazer Detroit Engine Div., 12801 East Jefferson, Detroit, Mich.

Bell, James Goebel (Jun. '47) Junior, State Div. of Highways, 2d and Spring Bldg., Los Angeles (Res., 717 West Glenoaks Blvd., Glendale 2), Calif.

Birkett, Richard Beaumont (Jun. '47) Junior Eng. Aid, Illinois Central R.R. Co., Div. Office (Res., 314 West Elm St.), Carbondale, Ill.

Bishop, Loren Emerson (Assoc. M. '47) Lt. Col., Corps of Engrs., U.S.A., Army Post Office 703, Care, Postmaster, San Francisco, Calif.

Briscoe, John William (Jun. '47) 305 South 8th Ave., La Grange, Ill.

Bromberg, Milton (Jun. '47) Asst. Engr., Pacific Fruit Express Co., 85 Second St. (Res., 2614 Jackson St.), San Francisco, Calif.

Cagley, Leo W. (Jun. '47) Asst. Civ. Engr., Office Engr., Div., Panama Canal (Res., Box 421), Balboa Heights, Canal Zone.

Calkins, Paul Sylvester (M. '47) Cons. Engr., 416 Fox Bldg., Detroit 1, Mich.

Carson, Warren Paul (Assoc. M. '47) Office Engr., Tennessee Valley Authority, Gilbertsville (Res., Gilbertsville), Ky.

Causey, James Campbell, Jr. (M. '47) Associate Civ. Engr., Myron A. Sturgeon Civ. Engr., 2115 Kimball Terrace, Norfolk (Res., Box 354, R.F.D. Riverview Drive, Suffolk), Va.

Chinn, Armstrong (M. '47) Pres., Terminal R.R. Assn. of St. Louis, 210 Union Station, St. Louis, Mo.

Closson, John Eugene (Assoc. M. '47) Civ. Engr., Benham Eng. Co. (Res., 2122 Drakestone), Oklahoma City, Okla.

Cochrane, Fred Davis (Assoc. M. '47) Asst. Dist. Airport Engr., Civ. Aeronautics Administration, Room 405, Municipal Bldg., Oklahoma City, Okla.

Congleton, David Densmore (Assoc. M. '47) Head of Dam Design Section, Corps of Engrs., 24th and Maryland (Res., Hopkins Apt., 3100 St. Paul), Baltimore, Md.

Conrado, Charles Domonic (Jun. '47) Junior Civ. Engr., California Oil Co., Rangely (Res., Box 664, Meeker), Colo.

Converse, Dean John (Jun. '47) 1132 James Ave., St. Paul 5, Minn.

Corman, Stanley Ira (Jun. '47) Junior Structural Designer, Skidmore, Owings and Merrill, Box 385 (Res., 148 East Drive), Oak Ridge, Tenn.

Crowley, John Arthur (Jun. '47) Engr. P-3, Civ., U.S. Engr. Dept., Fort Norfolk, Norfolk, Va.

Dacquisto, Angelo Arnold (Assoc. M. '47) Instr. in Pre-Eng., Mohawk College, Utica, N.Y.

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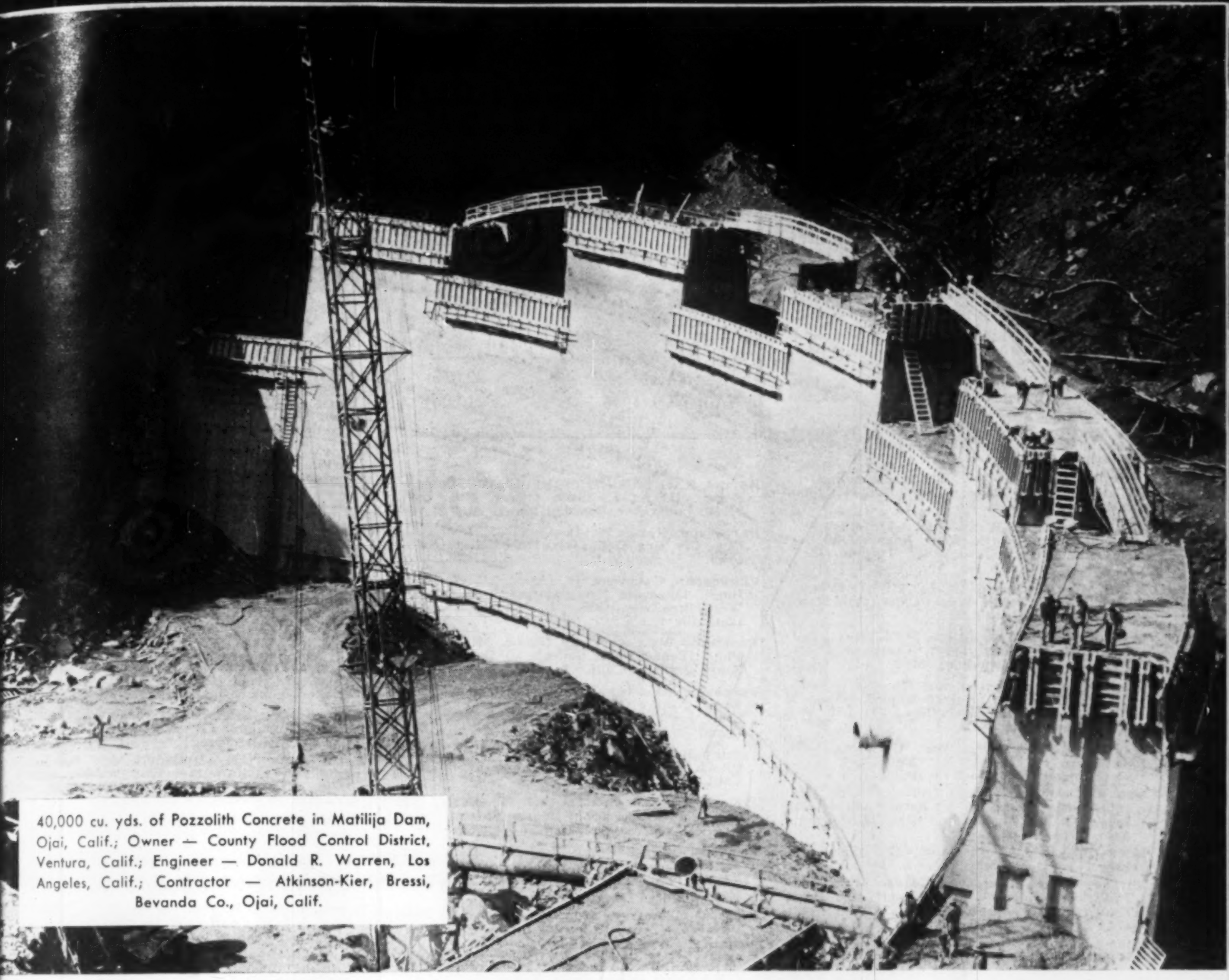

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Associate Members	8,716
Corporate Members	15,425
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Juniors	6,498
Affiliates	74
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Total	22,037
(August 9, 1946	21,506)

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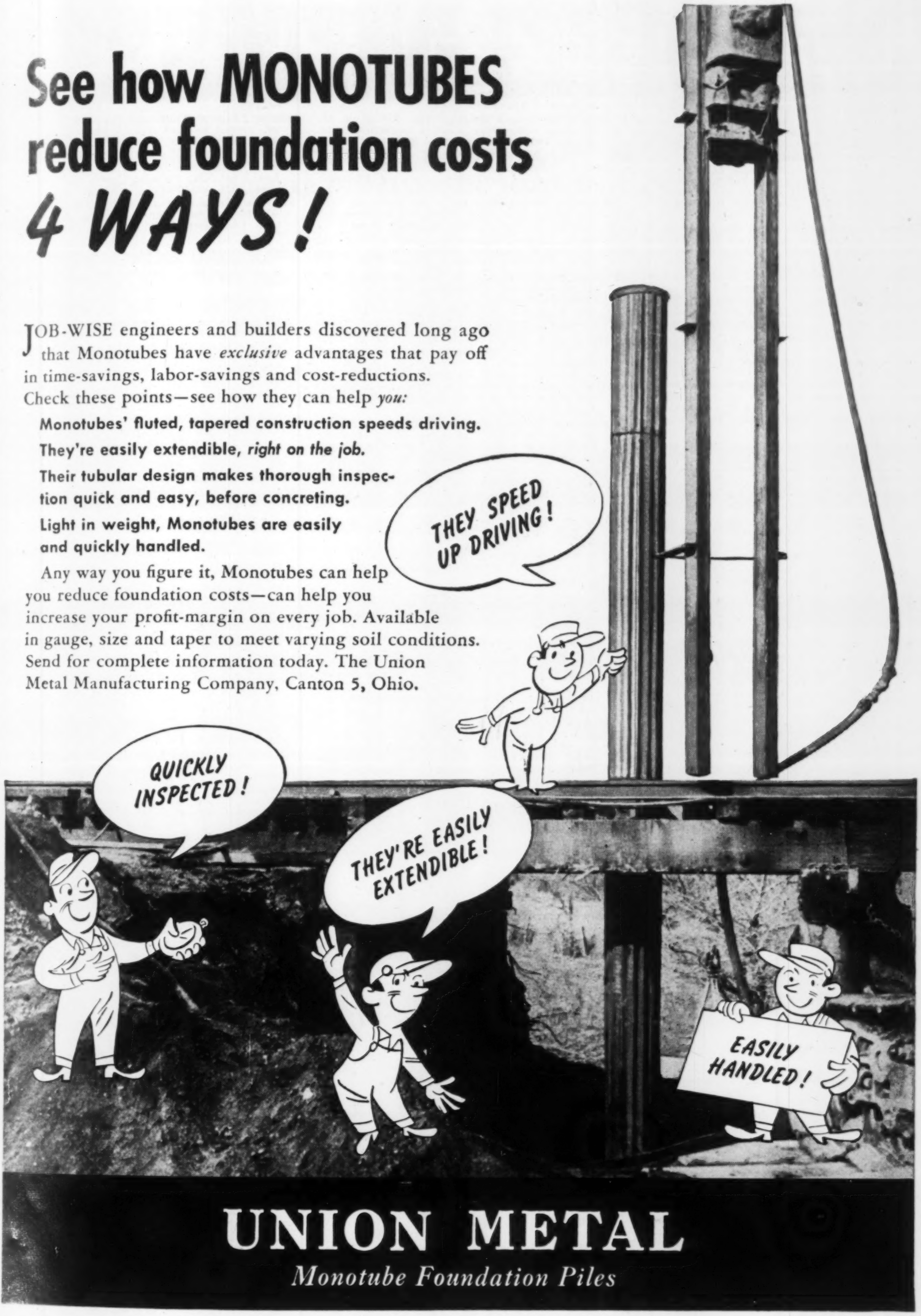
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Randall, Gifford Myron (Jun. '37; Assoc. M. '47) Treas., R. M. Roelse, Inc., 2072 Addison St., Berkeley (Res., 1331 Mountain Blvd., Oakland 11), Calif.

Reickert, Frederick Arthur (Jun. '38; Assoc. M. '40; M. '47) Asst. Chf. Designer, Hazelet & Erdal, 53 West Jackson Blvd. (Res., 6623 North Monticello Ave., Lincolnwood), Chicago 45, Ill.

Rose, Franklin Orth (Assoc. M. '24; M. '46) Associate Prof. of Civ. Eng., Brown Univ., Providence, R.I.

Ross, Paul Garner (Assoc. M. '26; M. '47) Section Head, Docking Facilities Section, Bureau of Yards and Docks, Navy Dept., Washington, D.C. (Res., 314 Grosvenor Lane, Bethesda 14, Md.)

Rountree, Seaborn Reuben, Jr. (Jun. '37; Assoc. M. '47) Chf. Draftsman, City of Austin, Municipal Bldg. (Res., 610 Kinney Ave.), Austin 22, Tex.

Ryder, Lincoln Woodbury (Jun. '33; Assoc. M. '47) Project Engr., Metcalf & Eddy, 1300 Statler Bldg., Boston (Res., 22 Park St., Wollaston 70), Mass.

Sharp, James Francis (Jun. '35; Assoc. M. '47) Asst. Engr., City Planning Comm., 301 City Hall (Res., 2211 Dixie Place), Nashville, Tenn.

Shepard, Charles Harold (Jun. '36; Assoc. M. '47) Engr., Ohio Highway Testing & Research Lab., Ohio State Univ. Campus, Columbus 10, Ohio.

Sims, Flournoy William (Jun. '41; Assoc. M. '47) Head, Soils Laboratory, Corps of Engrs., Little Rock Engr. Dist., 300 Broadway, Little Rock, Ark.

Sullivan, Arthur Bushnell (Jun. '36; Assoc. M. '47) City Mgr. and Engr., City of San Mateo City Hall (Res., 114 Burbank Ave.), San Mateo, Calif.

Toppen, Theodore Samuel (Jun. '43; Assoc. M. '47) Asst. San Engr., State Health Dept. (Res., 128 North Glover St.), Baltimore 24, Md.

Vollmer, Victor Allen (Assoc. M. '31; M. '47) Asst. Chf. Engr., Ellis Wing Taylor, 893 West 3d St., Los Angeles (Res., 2636 Creston Drive,, Hollywood 28), Calif.

Volz, Lawrence Henry (Jun. '36; Assoc. M. '47) Cecilia St., Gen. Delivery, Grayslake, Ill.

Voodhigula, Utai (Jun. '38; Assoc. M. '47) Chf. of Technical Div., Highway Dept. of Siam, Care, Highway Dept., Bangkok, Siam.

Willard, Edwin Ruthven (Assoc. M. '25; M. '47) Prin. Engr., Reconstruction Finance Corp., 811 Vermont Ave., N.W. (Res., 2501 Que St., N.W.), Washington 7, D.C.

Woods, Joseph Marion (Assoc. M. '33; M. '47) Superv. Engr., Reconstruction Finance Corp., P.O. Box 1637, Cincinnati, Ohio. (Res., 1157 Robinson St., Jackson 10, Miss.)

Reinstatements

Cunney, George Aloysius, M., Research Control Engr., Navy Dept., Bureau of Yards and Docks BuDocks Annex, Arlington, Va. (Res., 2233 Observatory Pl., N.W., Washington 7, D.C.), readmitted July 21, 1947.

Drummy, John Ready, Assoc. M., P.O. Box 2532, Raleigh, N.C., reinstated July 18, 1947.

Gibson, Alexander McKay, Assoc. M., Senior Asst. Designing Engr., City of Philadelphia, City Hall Annex Bldg. (Res., 6000 Columbia Ave.), Philadelphia 31, Pa., readmitted July 21, 1947.

Hilderman, Richard Alan, Jun. 608 South Liberty St., Winston-Salem, N.C., reinstated Aug. 5, 1947.

Hendrickson, Ellwood Robert, III, Jun., Oficina Tecnica Stubbins Apartado 7, Caracas, Venezuela, reinstated July 9, 1947.

McClain, Charles Warner, M., Engr. of Specifications, State Highway Comm., State House Annex, Indianapolis (Res., Plainfield), Ind., readmitted June 16, 1947.

Peterson, Edmund Nicolai, Assoc. M., Cons. Engr., Northwest Power Pool, Ebasco Services Inc., 809 Public Service Bldg., Portland 4, Ore., readmitted June 16, 1947.

Plath, Albert John, Assoc. M., Structural Engr. P-3, U.S. Engrs., Galveston, Tex., readmitted, June 16, 1947.

Pyle, Clyde Beethoven, M., Training Officer and Contract Officer, Veterans Administration, Philadelphia (Res., 4121 Sommers Ave., Drexel Hill) Pa., reinstated Aug. 4, 194.

Sagehorn, Ernest Henry, Assoc. M., Asst. Bridge Engr., State Dept. of Public Works (Res., Route 1, Box 404), Sacramento, Calif., readmitted May 19, 1947.

Resignations

Bennet, Harold Housley, Assoc. M., 5072 Tennyson St., Denver 12, Colo., resigned July 22, 1947.

Dobbs, Melvin Arthur, Assoc. M., 325 East Broadway, East St. Louis, Ill., resigned July 17, 1947.

Dyktor, Herbert George, Assoc. M., Cleveland Div. of Health, Rm. 17, City Hall, Cleveland 14, Ohio, resigned July 17, 1947.

Konold, Armine Lovin, Jun., 85 Henry St., San Francisco 14, Calif., resigned July 18, 1947.

Malek, Joseph Stanley, Jun., 37 Godfrey St., Taunton, Mass., resigned July 17, 1947.

Mueller, Ralph William, Jun. 255 Pine Hill Drive, Mobile 18, Ala., resigned July 17, 1947.

Olsen, Newell Preston, Jun., 128 South 1st East St., Logan, Utah, resigned July 16, 1947.

Von Schlatzer, Robert Karl, Assoc. M., Public Roads Administration, Federal Works Agency, Washington 25, D.C., resigned July 17, 1947.

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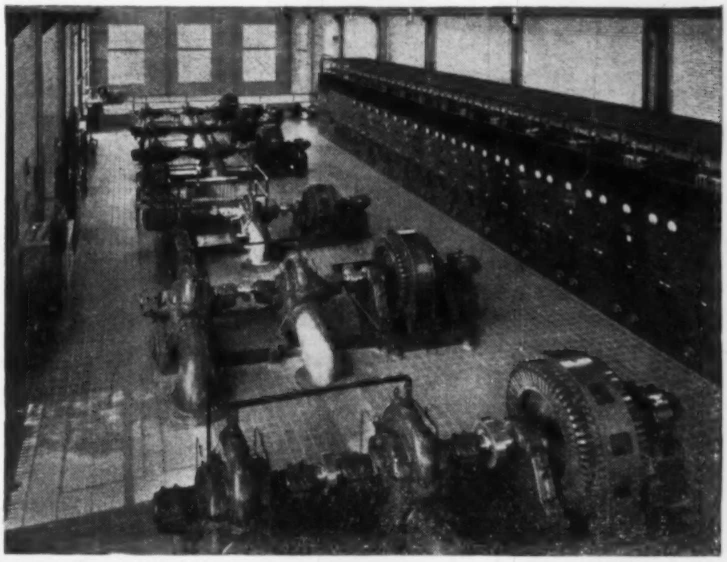

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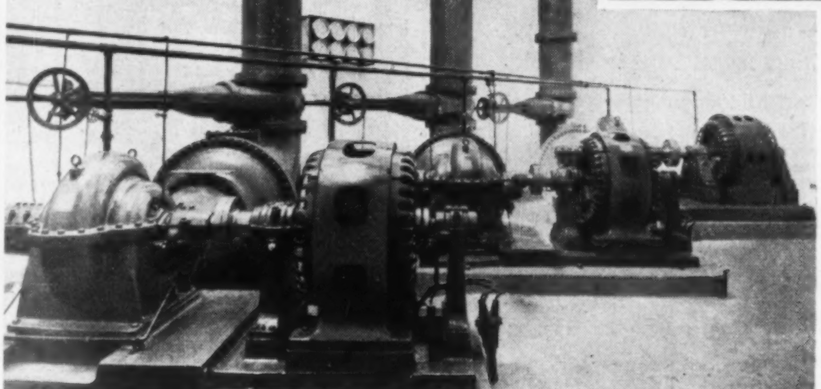

LEFT: Basement floor, showing three of four 500-hp Westinghouse motors, each of which drive a 30 mgd raw-water pump. Three 900-hp Westinghouse vertical motors, driving clear-water pumps, are also located on this floor but are not seen in this picture.

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Structural Engineer; 24; Jun. ASCE; single; honor graduate; 2 years' experience in design, drafting and field work for industrial construction firm. Speak Spanish and French. Desire opening with engineering firm, preferably abroad. Non-related fields considered, especially in economic or appraisal fields. C-385.

Sanitary Engineer; Assoc. M. ASCE; M.S.; 43; married; registered civil engineer. Twelve years' experience in construction—supervision, planning, estimating; reinforced concrete—highways, pipe lines, water-works, sewage and industrial waste treatment installations. Three years in Naval Construction Battalions. Desire permanent connection in sanitary engineering design or operational field. C-386.

Executive Engineer; M. ASCE; 37; registered professional engineer; wide experience, administration, design, construction and maintenance of large projects for consultants and contractors; Commander, CEC, USNR: Commanding Officer, Seabee Battalions; design manager and resident engineer. Excellent references. C-387.

Soil And Foundation Engineer; Assoc. M. ASCE; 36; married; licensed; 10 years' experience—principally in design of airfield pavements, earth dams, and levees. M.S. in engineering. Available on 30 to 60 days notice. Location preferred, Pacific Coast. C-388-476-A-2.

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Civil Engineer, young, single preferred, with some knowledge of Spanish. Should be interested in foreign work and have had some experience in general engineering—i.e., designing reinforced concrete, surveying and estimating. Permanent. Location, Ecuador. W-9361. Reopened.

Civil Engineer with 5 to 10 years' experience in facilities and outside supervisory construction work for company having a number of plants. Will handle correspondence with architects and engineering firms. Salary, $4,800 a year. Headquarters, New York, N.Y. W-9404.

Design-Draftsmen with experience in structural and architectural fields, for large central engineering department of a process manufacturing company. Salary, $4,680 a year. Location, New York, N.Y. W-9419.

Structural Designer familiar with rigid-frame structures, to work on subaqueous highway tunnel projects. Salary to start, $4,200 a year. Location, Alabama. W-9434.

Chief of Party, 25–35 preferred, civil engineer, qualified for field party survey, light construction, open pit mining, and competent in notes and office work. Salary, about $3,200 a year. Location, central Florida. W-9437.

Designers, experienced, for the following fields: bridges and highways. Salaries, $2,400–$3,300 a year. Highway Draftsman. Salary, $2,100–$2,400 a year. Location, Florida. W-9446.

Instructors, two, of civil engineering, mostly classroom work. One should have some knowledge of soil mechanics. Salaries, $2,100–$3,000. Location, New York State. W-9447(*a*).

Project Manager, civil graduate, 40–50, with at least 10 years' experience on pier, bulkhead, and waterfront construction, to supervise harbor improvements. Must have had Latin-American experience. Salary, $8,000–$10,000 a year. Location, Venezuela. W-9468.

Civil Engineers. (*a*) Field Engineer, under 30, to represent company with contractors; check estimates, specifications, etc. Some traveling. (*b*) Office Engineer, not over 40, for design and drafting, preparation of plans for contractors, specifications, etc. Must have had experience on industrial buildings. Location, New York, N.Y. W-9469.

Party Chief, civil graduate, with at least 5 years' building construction experience, to supervise layout, line and grade, etc., on industrial project. Salary, $4,680–$5,200 a year. Location, Long Island, N.Y. W-9477.

Designer, civil graduate, with at least 5 years' heavy construction design experience, to design and lay out foundations and structures for rolling mill equipment. Salary, $5,000–$6,000 a year. Location, Pennsylvania with probable 10- to 12-month trip to Africa. W-9478.

Architectural Draftsman. Must have had experience on small housing and stores. Salary open. Location, Long Island, N.Y. W-9481.

Field Engineer to take charge of construction of sewage treatment plant and pumping station. Salary open. Location, Connecticut. W-9489.

Recent Graduate, civil, to work in field for construction company. Salary, $2,600–$3,000 a year. Location, New York, N.Y. W-9497.

Civil Engineer, graduate, young, to design, estimate and, eventually, do some selling for manufacturer of reinforced concrete products Location, northern New Jersey. W-9506.

Transitman, with several years' experience, to make title surveys and, on occasion, act as chief of party. Salary, $2,600–$3,900 a year. Location, Long Island, N.Y. W-9512.

Engineers, architectural, structural, with at least 3 years recent drafting board experience, to design and lay out industrial plants. Salary $4,000–$5,000 a year. Location, northern New Jersey. W-9515.

Structural Engineer, with experience in design and detail of structural steel plates and shapes, reinforced concrete, conveyors and piping layouts, to design coal preparation plants. Salary, about $5,700 a year. Modern, low-rental housing available. Location, West Virginia. W-9516.

Design Engineer with broad experience in design of sewer and water systems and treatment plants. Excellent opportunity for well-qualified man in consulting engineer's office. Salary, $500–$600 a month. Location, Texas. R-4348.

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JULY, 1947

Current Periodical Literature

Abstracts of articles on civil engineering subjects from other periodicals. Articles indexed are on file in the Engineering Societies Library, 29 West 39th St., New York 18, N. Y., from which photoprints or technical translations are available at cost.

BRIDGES

Highway, Standards. Standard Bridge and Culvert Plans, E. J. Miller. *Better Roads*, vol. 17, no. 6, June 1947, pp. 23–24, 36. Review of standards prepared by Minnesota Dept. of Highway's bridge division to assist in rehabilitation of structures on Minnesota township roads. Steel, concrete, timber and combination designs included.

Maintenance and Repair. Bridge Job Rushed to Eliminate Long Detour, A. J. Stocks. *Calif. Highways & Pub. Works*, vol. 25, nos. 3, 4, Mar.-Apr. 1947, pp. 15, 32. Illustrated description of rebuilding of 119-ft steel-truss White's Bridge across Kings Slough west of Fresno, Calif., which collapsed under overload. Work except asphalt surfacing was completed in 17 days.

Railroad, Fire Protection. Fire-Retardant Coatings for Use on Open-Deck Bridges, U. S. Attix. *Ry. Eng. & Maintenance*, vol. 43, no. 5, May 1947, pp. 482–483, 490. From experience with open-deck trestles on mountainous grades, Southern Pacific has found that most of fires on these bridges have their origin in splinters from overheated brake shoes dropping on timber. Description of practice of this road in using crushed stone and asphalt to protect these structures. Before Fire Protection & Insurance Section, Assn. Am. Railroads.

BUILDINGS

Concrete. Dampney Precast Concrete Slabs, H. B. Fletcher. *Concrete*, vol. 55, no. 5, May 1947, pp. 32–33. Illustrated description of Dampney house which is constructed almost completely of precast concrete slabs and studs; foundation is also made of concrete blocks. Dampney houses built under different climatic conditions in Australia are reported satisfactory.

Fire Prevention. How Fire-Safe Is Fireproof Building? J. J. Ahern. *Eng. News-Rec.*, vol. 138, no. 24, June 12, 1947, pp. 942–945. Four basic requirements determine relative fire safety of buildings for human occupants. Design data and tested products are available to meet these essential needs in both old and new structures at costs which are low in comparison with toll exacted by loss-of-life fires.

Hotels, Fires. Report of Winecoff Hotel Fire, Atlanta, Ga. *Bldg. Standards Monthly*, vol. 16, no. 5, May 1947, pp. 6–9. Findings and recommendations based on report of Inspection Committee of Winecoff Hotel Fire on Dec. 7, 1946.

United Nations. New York Prepared for United Nations, R. G. Weintraub and R. Tough. *Am. City*, vol. 62, no. 5, May 1947, pp. 67–70. Description of buildings to be erected for United Nations in New York City. Data on site, legal framework, planning, zoning, and construction program.

CITY AND REGIONAL PLANNING

Great Britain. Planning Triumphs Over Anarchy, D. Archibald. *Am. City*, vol. 62, no. 4, Apr. 1947, pp. 94–95. Bath, England, will restore its shattered city, retaining historical beauties while building for modern culture. Development of Bath, and problems to be solved.

Newark, N.J. Nearly Quarter Billion in Quarter Century, J. R. Burnett. *Am. City*, vol. 62, no. 5, May 1947, pp. 90–91. Plans and proposals of master plan for redevelopments and rehabilitation of Newark. Plan contemplates an over-all capital expenditure of $244,176,500 of funds for municipal, county, state, national and private enterprise sources over next 23 years.

Washington, D.C. Washington Has Local Problems, Too, H. P. Caemmerer. *Am. City*, vol. 62, no. 6, June 1947, pp. 73–75. Discussion of plans for Washington's municipal needs re-

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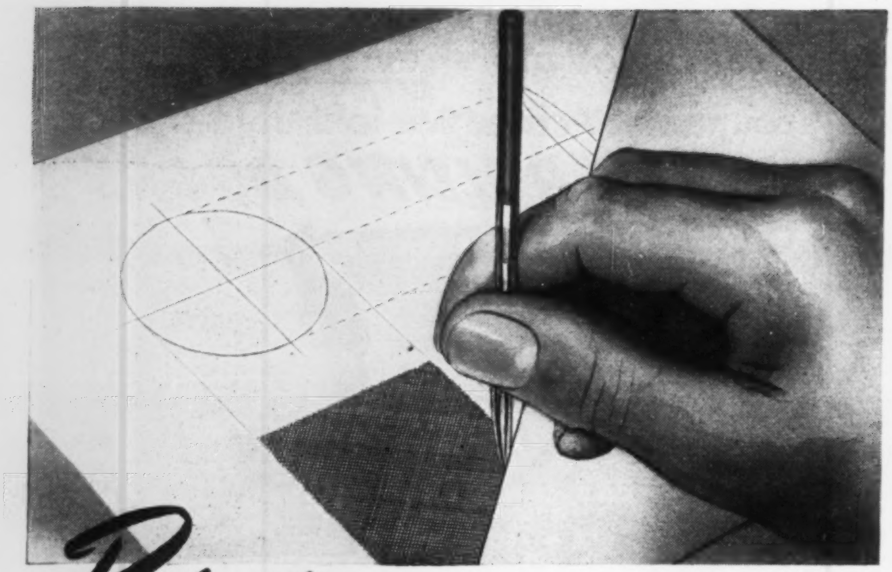

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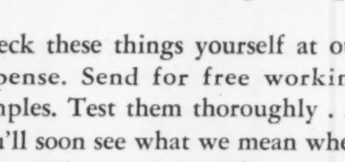

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sulting from effects of wartime and postwar overpopulation. Plans include highways, central heating plant, slum clearance, improvement of water supply and hospitals.

Zoning, Airports. Protecting Your Airport Investment, J. C. Frederick. *Pub. Works*, vol. 78, no. 7, July 1947, pp. 24–26, 66. Review of zoning regulations and procedures, with special reference to New York State, which may be followed to protect airport against encroachment by obstacles to its full use.

CONCRETE

Aggregates. Lightweight Aggregates for Concrete. *Pub. Works*, vol. 78, no. 5, May 1947, p. 16. Data on material used as light-weight concrete aggregate; Haydite, "foamed" slag, pumice, diatomite, perlite and vermiculite are considered.

Air Entrainment. Camera Lucida Method for Measuring Air Voids in Hardened Concrete, G. J. Verbeck. *Am. Concrete Inst., J.*, vol. 18, no. 9, May 1947, pp. 1025–1039. Description of method which involves use of camera lucida in conjunction with microscope; air content of hardened concrete as determined compare satisfactorily with results obtained by other methods. Method is applicable to study of weather resistance of concretes from structures of various ages to determine extent to which entrained air may have contributed to weather resistance.

Embankments. Concrete Riprap Bridge Approaches. *Western Construction News*, vol. 22, no. 4, Apr. 1947, p. 81. Use of sacked concrete riprap as bank protection is being tried for first time in Niles Canyon, Calif., area where new highway is being built in former creek bed. Construction includes new bridge over Western Pacific Railroad, approaches of which required bank protection; cement and aggregate were placed dry in sacks which were later wet to form concrete.

Fences. Unique Sectional Concrete Fence Developed by California Concern, H. F. Utley. *Pit & Quarry*, vol. 39, no. 11, May 1947, pp. 169–170. Permanent fences made of precast reinforced concrete panels up to 5 ft high, 1 ft wide and 1.75 in. thick are held rigidly in position in poured concrete base; data on construction and cost.

Houses. "Formless Concrete" Houses. *Concrete*, vol. 55, no. 6, June 1947, pp. 20–22. Illustrated description of experimental houses built in River Grove, suburb of Chicago. Method of "formless concrete," invented by R. J. Sipchen, consists of building surface of wall first, then completing it by pouring load-bearing part last. Typical construction stages described and illustrated.

Mixers. Giant Mixer Supplements Tournalayer. *Western Construction News*, vol. 22, no. 4, Apr. 1947, p. 85. Description of 7-cu yd transit concrete mixer which is capable of delivering concrete necessary for monolithic concrete house in record time. Mixer enables pouring at heights up to 20 ft thus eliminating necessity for scaffolding and other equipment.

CONSTRUCTION INDUSTRY

Airports, San Francisco. Mammoth Earthmoving Project Under Way at San Francisco Airport Site. *Western Construction News*, vol. 22, no. 4, Apr. 1947, pp. 73–77. Illustrated report on construction of airport in San Francisco, Calif., with special reference to earthmoving processes and equipment. Plan proposes four 7,750-ft runways. Work under way involves fleet of 85 heavy trucks and 7 shovels which form production line to move 6,000,000 cu yd of earth and reclaim 300 acres of land from bay.

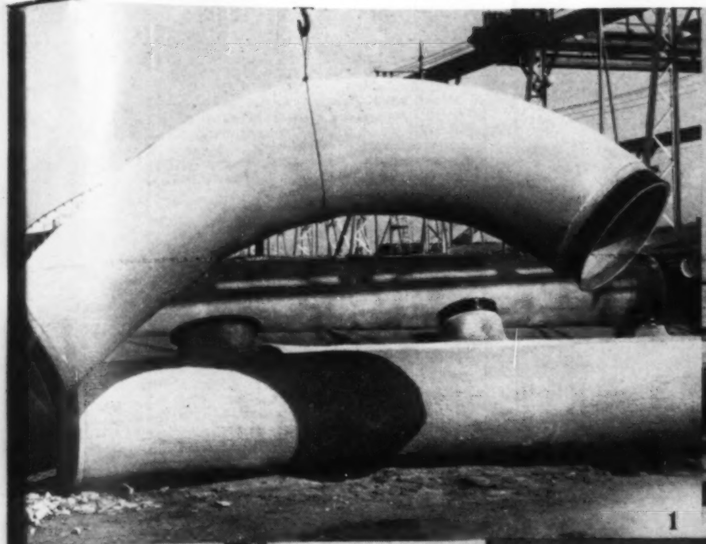
DAMS

Concrete, Repair. Disintegrating Upstream Face of Dam Preserved with Blanket of Concrete. *Western Construction News*, vol. 22, no. 5, May 1947, pp. 94–95. Upstream face of Barker concrete dam, 17 miles west of Boulder, Colo., deteriorated through frost action; illustrated description of repair performed with aid of concrete slabs and Prepakt concrete after moving damaged parts. Slabs are held in place by grouted anchors.

Concrete Arch, California. Matilija Dam—Two Separate Dam Types Combined. *Western Construction News*, vol. 22, no. 4, Apr. 1947, pp. 86–88. Matilija Dam near Ventura, Calif., consists of 2 parts. Its concrete gravity section extending from elevation of 935 ft to 960 ft is separated from thin concrete arch by slip joints so that arch stress will not affect base. Data on foundation, concrete, pouring and equipment.

Concrete Gravity. Allatoona Dam Ready for Concrete. *Construction Methods*, vol. 29, no. 5, May 1947, pp. 82–85. Concrete gravity dam in Etowah River gorge in Georgia is combined flood control and power project; data on construction, cofferdam, cableway, excavating equipment and concrete plant.

Concrete Gravity, Repair. Joint Leakage Stopped at Marshall Ford, W. B. Bierce. *Eng. News-Rec.*, vol. 138, no. 22, May 29, 1947, pp. 692–694. Marshall Ford Dam on Colorado



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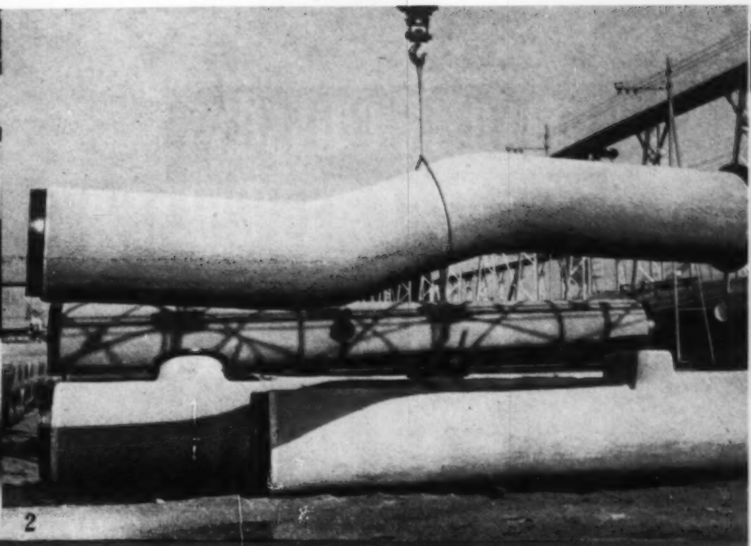

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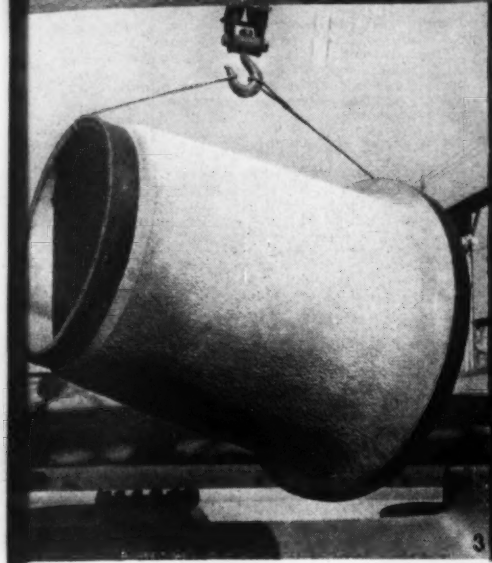

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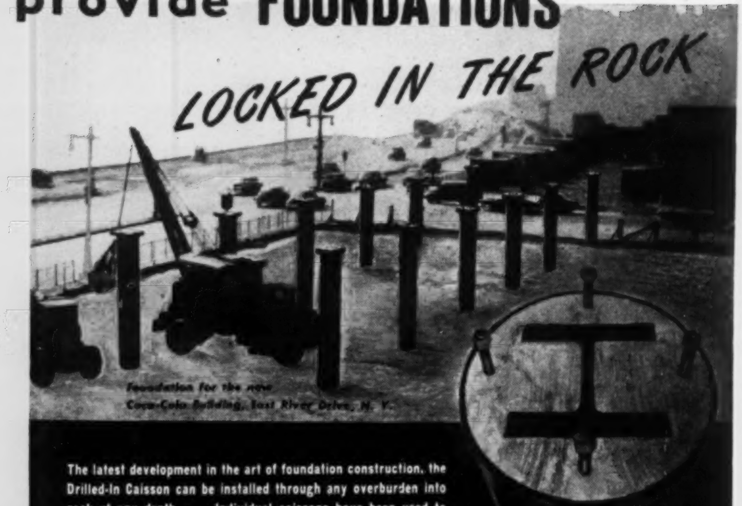

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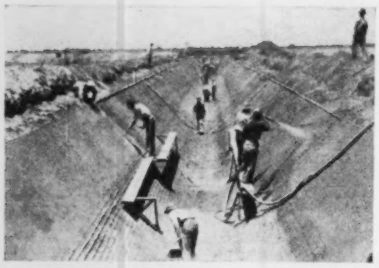

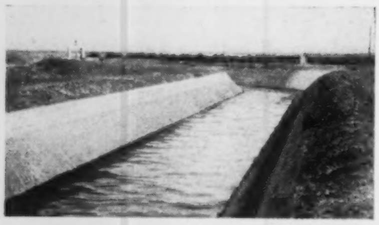

"GUNITE" FOR LINING IRRIGATION CANALS

The reinforced "GUNITE" lined canals illustrated were built by us in 1940. This job is the largest we have done and is near Raymondville, Texas. It involved 214 miles of canals, large and small, or about 11½ million square feet of "GUNITE."

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River near Austin, Tex., leaked at longitudinal joint created by constructing dam in two stages. Repair was achieved by enlarging joint and filling it with mastic and dry-pack mortar in abutment sections, and dry-pack mortar and rubber strip in spillway section. Illustrated description of procedure.

FLOOD CONTROL

KENTUCKY. No More Floods for Louisville. *Am. City*, vol. 62, no. 5, May 1947, pp. 84–85. Data on flood wall under construction to protect Louisville, Ky., from Ohio River floods; report on previous floods and damages caused by them; brief notes on projects of other cities.

FOUNDATIONS

WALL FOOTING ACTION POSES ENIGMAS, H. S. Woodward. *Eng. News-Rec.*, vol. 138, no. 24, June 12, 1947, pp. 955–958. Inadequacy of conventional methods of designing eccentric wall footings is indicated by conditions disclosed on inspection of building substructures. While some footings have failed or settled excessively, others are performing satisfactorily. Rules taught by soil mechanics should be applied to their design.

SOILS, FROZEN. Permafrost—Arctic Building Problem, R. Robinson. *Constructor*, vol. 29, no. 6, June 1947, pp. 28–32. Permafrost zones in Arctic; factors to be considered in connection with foundations in permafrost; construction principles and suggestions made for building construction; notes on arctic research undertaken by Army engineers near Fairbanks, Alaska.

HYDRAULIC ENGINEERING

RESEARCH. Hydraulic Research in United States. U.S. Bur. Standards, Hydraulic Laboratory, *Bul.* vol. 11, Apr. 1947, 163 pp. Bulletin is first edition to be published since 1942, when Vol. 10 appeared. Information contained is compiled with cooperation of various hydraulic and hydrologic laboratories in United States; it contains summary of research now in progress in these laboratories, as well as research which has been completed since last bulletin was issued.

INLAND WATERWAYS

ICE PROBLEMS. Ice Blockage of Canadian Ports, J. G. G. Kerry. *Dock & Harbour Authority*, vol. 27, nos. 317, 318, Mar. 1947, pp. 273–276, Apr., pp. 301–304, 318. Summary of information available on conditions of ice formation on rivers and lakes of northern regions of United States and Canada, and in Europe. Author finds that there is scope and need for acquisition of further data to enable problem to be investigated with greater precision and puts forward plea for government assistance in matter. Before Eng. Inst. of Canada.

SHORE PROTECTION. Development of Concrete Revetments on Lower Mississippi, R. H. Haas. *Concrete*, vol. 55, nos. 4, 5, Apr. 1947, pp. 3–8, 41, May, pp. 16–18, 33. Principle of bank revetment design; monolithic and articulated concrete paving, and reinforced slab revetment; description of sinking plant; experiments with roll-type flexible concrete mattress and with concrete blocks and slabs.

IRRIGATION

WATER SUPPLY, CALIFORNIA. Salinas Basin Investigation. *Calif. Dept. Pub. Works—Div. Water Resources—Bul. no. 52*, 1946, 230 pp., 5 supp. plates. Report of Salinas Valley Flood Control and Water Conservation Committee of Monterey County. Data on hydrology, quality, contamination and conservation of water, ground water storage, surface streams, ultimate demand of water, irrigation and legal considerations.

PORTS AND MARITIME STRUCTURES

CONCRETE PIERS. Concrete Pumped. *Construction Methods*, vol. 29, no. 5, May 1947, pp. 96–100, 168, 170. 5,400 concrete piles up to 80 ft long for pier at Norfolk, Va., were cast in timber pallets, loaded on flat cars and delivered by transfer barge to driving rigs. Pier deck is 9-in. concrete slab. Pumpcrete machine is used to pump concrete to forms both for piles and slab. Description and illustration of typical construction stages.

ROADS AND STREETS

AIRPORTS, CONSTRUCTION. PRA Paves Panama Airport at Acre-A-Day Clip. *Construction Methods*, vol. 29, no.5, May 1947, pp. 90–93. Construction of Panama National Airport, including moving more than 3,000,000,000 cu yd of earth, placing 220,000 cu yd of silt stone for subgrade and concrete paving of 472,000 sq yd; data on mechanical equipment.

AIRPORTS, SNOW REMOVAL. New Method of Removing Snow From Airports, J. R. Shannon. *Roads & Bridges*, vol. 85, no. 4, Apr. 1947, pp. 95–96, etc. Using specially designed plow, mounted on four-wheel-drive truck, method of airport snow-removal has been developed which is claimed to be more effective and speedier than methods which depend on types of plows designed primarily for clearing snow from highways. Truck traveling at 25 mph, causes snow to be

partners in creating

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thrown 30 to 40 ft to one side without developing objectionable banks.

British Columbia. Tough Grading Job on Rocky Mountain Road. *Eng. & Contract Rec.*, vol. 60, no. 4, Apr. 1947, pp. 54–56. Illustrated data on construction of Hope-Princeton road from Fraser Valley through Hope Mountains to Kamloops. Design provides 30 ft width exclusive of drainage ditches. Roadbed is to be surfaced with crushed gravel on 6-in. to 12-in. base of crushed material.

Curbs. Curbs Built of Asphaltic Concrete to Cut Highway Maintenance Costs. *Eng. News-Rec.*, vol. 138, no. 20, May 15, 1947, pp. 810–811. Curb and gutter built of hot laid asphaltic concrete are being added in cut sections on U.S. Route 1 in Maryland to reduce major maintenance problem. Gutter is first paved and then curb is added as second operation. Although hand tools are used for all operations, costs are considered reasonable.

Drainage. Pavement Pumping Prevented, W. C. Slee. *Western Construction News*, vol. 22, no. 6, June 1947, pp. 87–88. Kansas State Highway Dept. uses drains along transverse points of road pavements supplemented by longitudinal drains at shoulders to eliminate pumping at joints of concrete road slabs. Method, superior to other methods, eliminates objectionable seepage and softening of base.

SEWERAGE AND SEWAGE DISPOSAL

Activated Sludge. Economic Flocculation of Sewage Colloids, J. Finch and L. S. Wright. *Pub. Works*, vol. 78, no. 5, May 1947, pp. 13–14. Modification of activated sludge process combined with bioflocculation and filtration; process is explained with aid of layout of plant; after sedimentation, $^1/_3$ to $^1/_4$ of sewage flow is treated by activated sludge process and then remixed with remainder of sewage. Before Inst. of Sewage Purification.

Industrial Wastes. Industrial Waste Disposal, G. E. Barnes. *Mech. Eng.*, vol. 69, no. 6, June 1947, pp. 465–470. General aspects of stream pollution and sewage treatment, as background for understanding problems in handling of industrial wastes; scope of industrial waste pollution with particular emphasis on critical situation throughout Midwest; typical wastes are discussed and manner in which treatment may be effected.

Pipe Lines, Earth Pressure. Earth Pressures on Pipes in Deep Trenches. B. W. Sutherns. *Water & Water Eng.*, vol. 50, no. 613, Mar. 1947, pp. 118–122. Correlation of various tests and experiments on loading and deflection of pipes at various trench depths. Author suggests new formula for pressure on pipes, sewers and tunnels applicable to trench depths of 110 ft and dispensing with constant C_t, which is coefficient varying according to type of fill and ratio of height and width of trench.

TRAFFIC CONTROL

Traffic Signs, Signals and Markings. Improved Signs for N.J., R. L. Fisher. *Roads & Streets*, vol. 90, no. 5, May 1947, pp. 90–92. Visibility, planning phases, and structural details of neon lighted, bridge mounted directional and destination signs over 8-lane route near Newark, N.J.

TUNNELS

Avenues Underground, L. S. S-ifneur. *Excavating Engr.*, vol. 41, no. 6, June 1947, pp. 330–334, 368–371. Data on natural and artificial underground tunnels from 2180 B.C. to date; all types of tunnels dealt with such as canal, railroad, and subaqueous tunnels. Tunneling methods and first vehicular tunnel beneath Hudson River in New York City discussed.

New York City. Brooklyn-Battery Tunnel in New York City. *Eng. News-Rec.*, vol. 138, no. 24, June 12, 1947, pp. 930–937. Progress report on Brooklyn-Battery tunnel. Twin tubes will accommodate 2 lanes of traffic in one direction. Ventilation for midsection is to be provided by fans housed in tower above shaft near Governor's Island. Tunneling procedure in rock and mixed ground; installation of cast-iron lining.

WATER TREATMENT

Industrial, Conservation. Trends in Re-Use of Water by Industry, C. F. Hauck. *Pub. Works*, vol. 78, no. 5, May 1947, pp. 24, 26, 28. Summary of current practices in water conservation through treatment and re-use of industrial process waters, water from cooling and heating circuits and sewage plant effluent. Bibliography. Before Engrs., Soc. of Western Pennsylvania.

Taste and Odor Control. Activated Carbon Treatment of Open Reservoir, H. E. Bailey and J. Studley. *Water & Sewage Works*, vol. 94, no. 6, June 1947, pp. 219–232. Activated carbon successfully applied to Great Sandy Bottom Pond as treatment of water for taste and odor control without benefit of filtration in Abington and Rockland, Mass. Description of method of applying carbon; no carbon appears in distribution system.

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NEW DEVELOPMENTS OF INTEREST, AS REPORTED BY MANUFACTURERS

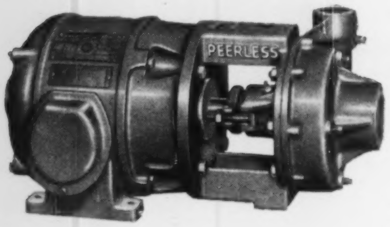
New Fluidyne Pump

Peerless Pump Division of the Food Machinery Corp. has recently introduced a single-stage, end suction, vertically split case, centrifugal pump designated as the Fluidyne.

The Peerless Fluidyne is being manufactured in two types, both of which are capable of moving water and other liquids in capacities up to 1,000 gpm against heads up to 270 ft. The Fluidyne type PE is an integrally coupled, compact electric unit in which pump and driving motor are anchored on the motor footing. The type PB is a belt driven unit with the iron frame and bearing mounts supporting the various pump sizes integrally cast. The latter type pump is either keyed to a V or flat belt pulley, as desired, or directly connected to a standard horizontal electric motor by means of a pin type flexible coupling.

The Fluidyne may be installed and will operate in any position—vertical, horizontal or intermediate angle. Ease of maintenance and accessibility are stressed.

Write for bulletin to Peerless Pump Division, Food Machinery Corp., 301 West Avenue 26, Los Angeles 31, Calif.



◆

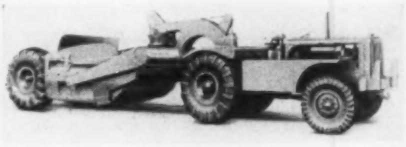
Bristol Announces New Line of Recording Thermometers and Gages

A new line of recording thermometers and recording gages known as the Series 500 line of records has just been announced by the Bristol Co., Waterbury 91, Conn. These instruments operate on the same basic principles as previously but are housed in a newly developed modern case and incorporate many design improvements to make them easier to use, more convenient to service, and readily convertible from one type to another. In addition, the company has, wherever possible, simplified the construction of the instrument.

Pen arms are pivoted on stainless steel journals with the pen arm shaft supported at both ends in a rigid one-piece mounting. The journals are ground and polished to provide low-friction action. Improvements have been made in the measuring element to improve its accuracy and the ease with which it can be adjusted. Write for Bulletin No. T835.

Wheel-Type Tractor and Scraper

Caterpillar Tractor Co., Peoria, Ill., announces production of a new "Caterpillar" Diesel DW—10 wheel-type tractor, a new "Caterpillar" No. 10 Scraper, and a new "Caterpillar" No. 21 Cable Control Unit.



This latest announcement of product development focusses on the power increase available in the DW—10 Tractor which now has a power output of 115 hp at 1800 rpm. Operating with auxiliary equipment, the unit takes on a wider range of heavy off-road jobs and high speed hauls.

In highway, dam, levee, and airport construction and general land-levelling, the new tractor, equipped with the new No. 10 Scraper, offers users outstanding digging and levelling characteristics. Coupled with a matching wagon, it makes possible speedy handling of material ranging from all types of earthmoving to many types of mine and quarry deposits.

Notable advantages of the new DW—10 model are: 15% increase in power output, and improved double plate, semimetallic faced clutch, constant mesh transmission, self adjusting clutch brake, spiral bevel gears to provide quiet operation, individual spur type final drive gears to transmit power to each driving wheel giving added strength, and new oscillating front axle offering easier ride over rough terrain.

The new "Caterpillar" No. 10 is designed exclusively for use with the new tractor. It has a heaped capacity of 11 cu. yds. and embodies such recognized features as open-bowl design visibility and access high apron lift and self-sharpening cutting edges.

The new "Caterpillar" No. 21 rear-mounted, double-drum cable control is matched to the requirements of the new tractor and scraper.

◆

New GMC Truck Models

Radical appearance changes plus revolutionary cab construction in the light and medium duty models and increased horsepower for the heavy duty gasoline and diesel group highlight the many improvements in the 1947 GMC truck line announced by the GMC Truck & Coach Division of General Motors.

The new light and medium GMC's will feature entirely restyled grille, hood and fenders, larger all-steel cabs with increased visibility, and many engine improvements.

New Tractor Scraper

Designed for speed of operation and serviceability, a new tractor-scraper designated the "Primemover" is in production at the Cedar Rapids, Iowa, factory of LaPlant-Choate Mfg. Co.

The unit consists of a two-wheeled, rubber-tired tractor, joined to a scraper by a pedestal hitch to form a single, integrated, self-propelled vehicle. Tractor is equipped with a 225 hp diesel engine and large Goodyear Sure Grip tires for maximum traction and flotation. High rate of drawbar pull in fourth gear results in high average haul speeds when loaded.

The scraper is a positive forced ejection type, operated by an air-actuated cable power unit, mounted on the rear of the tractor and deriving its power from the main engine. Steering of the unit is accomplished by two double-acting hydraulic jacks which are positively controlled by an LPC power unit mounted on front of the tractor.

The unit is equipped with four air-actuated brakes. It is designed for easy servicing and tapered roller bearings are used throughout to provide long service life.

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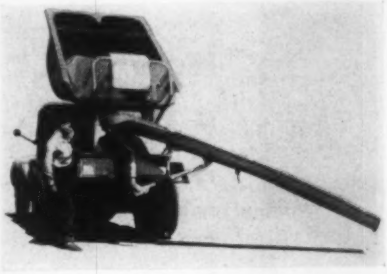
A New Dumpcrete



A new and improved 2-yd Dumpcrete manufactured by the Dumpcrete Division, Maxon Construction Co., Inc., 131 N. Ludlow St., Dayton 2, Ohio, has a specially designed watertight body for hauling air-entrained concrete and other materials.

The discharge height has been increased to a point of over five feet off the ground; the chute assembly can now be quickly and easily swung away to either side when desiring to dump sand and gravel or concrete without using the chute. Steel plate running boards have been added to provide protection from road dirt and can be used as a platform for operating the discharge controls.

A new size Dumpcrete is also being announced and is now in production. It will have a 3 cu. yd. rated concrete capacity and a water level capacity of 5 cu. yd. The same features added to the 2-yd. size will also be available as standard equipment on the new 3-yd size. In addition to these two models, a 4-yd body is also being produced.

Vimlite in Construction

A revolutionary development in winterizing new construction is offered by the use of Celanese Vimlite in place of tarpaulin weather shields.

Proved by Celanese during the construction last winter of its new Belvidere plant, Vimlite replaced the ordinary tarpaulins covering each successive course of brick and concrete construction work. Without shutting out daylight, Vimlite produced a higher inside temperature by 15 deg, enabling the builders to handle brick, cement and concrete under more efficient conditions than in the drafty semidarkness induced formerly by the use of tarpaulin coverings. Salamanders were more effective and the available heat of the sun, transmitted through unbreakable reinforced Vimlite, permitted work in lower outside temperatures.

Manufactured in two forms, plastic coated wire mesh and plastic coated plastic mesh, Vimlite has inherent flexibility and stamina which allows its use over and over again in construction work. Supplied in rolls 36 in. and 28 in. in width, Vimlite can be tacked or stapled to light framing or joined to produce any desired width or length of material. When the construction job is finished, Vimlite can be rolled up and stored until needed again.

Unlike canvas, Vimlite in use or storage does not constitute a fire hazard and the cost of both forms of the material is so low as to make it an economically sound investment for the contractor. For industrial use the cost of plastic coated wire mesh Vimlite can be figured at approximately 10¢ per sq ft, that of plastic coated plastic mesh about 14¢ per sq ft.

Celanese and Vimlite are registered trademarks of Celanese Corp. of America.

◆

New P & H Electric Shovel

P & H "Magnetorque" hoist drive is now offered as standard equipment on their 6-yd electric shovels, according to announcement received from Harnischfeger Corp.

This new principle of hoisting, which has proved so successful on other P & H electric shovels, simplifies the entire hoisting machinery including the power units. "Magnetorque" drive replaces the usual generator and d-c motor with a simpler a-c motor. The amount of torque to be transmitted is controlled through variable energizing of the magnetic field. Hoisting operations are therefore smoother.

Other advantages claimed for this type of control are elimination of customary hoist generator and its maintenance, smooth Ward Leonard performance with faster plugging, a reduction in peak power demands and power costs. With P & H "Magnetorque" drive, the customary slip-friction hoist clutch is also eliminated, and shock loads are cushioned.

Information on the P & H 6-yd electric shovel with "Magnetorque" drive can be had by writing Harnischfeger Corp., Excavator Division, 4400 W. National Ave., Milwaukee 14, Wis.

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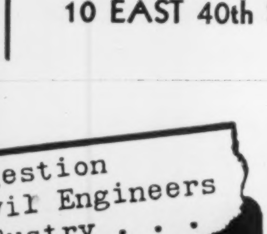

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New "Moto-Scraper"

LaPlant-Choate Mfg. Co.'s new "Moto-Scraper," is the first addition to that company's new line of rubber-tired tractors and allied earthmoving units.

The "Moto-Scraper" is a modern, high-speed tractor-scraper combination consisting of a two-wheeled rubber tired tractor joined to a 17.5 yd scraper by a pedestal hitch assembly to form a single integral self-propelled unit.

It is designed for digging, loading, transporting and spreading earth and other material on either long or short hauls.

The tractor is equipped with a 225-hp diesel engine and extra large 21:00×29 tires. It has four speeds forward and one reverse.

The scraper is a positive forced ejection type, operated by an air actuated cable power control unit. Steering of the unit is accomplished by two double acting hydraulic jacks positively controlled by a Fluid Power-Unit. Controls for the entire unit are located conveniently in the operator's compartment.

◆

Portable Water Carrier

The Dixie Cup Co., Easton, Pa., has recently placed on the market its new Dixie Portable Water Carrier. It is designed for use on construction jobs, by survey crews, by railroad maintenance crews, and for emergency use such as at fires. It is also useful in large manufacturing plants, steel mills, lumber yards, mines, or wherever drinking water is not readily available.

The Dixie Portable Water Carrier is made of stainless steel and is well insulated to keep water cool for many hours in the field. It has a recessed faucet which turns off automatically when released. A lug is provided for a single or double unit Vortex Paper Cup dispenser. The double unit dispenser has a receptacle for used cups. The carrier is finished in olive green with chrome trim. The capacity is approximetely 4 gal; size 18 in. high, 15 in. long, 8 in. wide. Two adjustable carrying straps are provided.

◆

Linn Haftrack

Designed for heavy duty industrial haulage, the New Model D-15 Linn Haftrack incorporates the following basic design improvements: Full contour traction for maximum engaged track area and increased stability, new long traction unit for greater load capacity and track area, higher speeds, either gasoline or diesel powered.

Chassi standard body styles available for contracting, oil drilling, cane hauling, mining, logging, snow removal, and general industrial haulage. New catalog available on request. For further details, contact The Linn Manufacturing Corp., General Sales Office, 250 W. 57th St., New York 19, N.Y.

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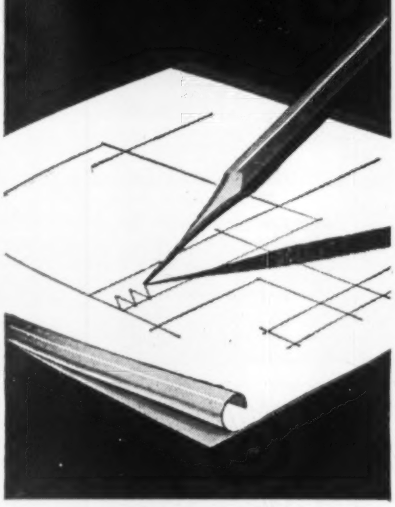

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Literature Available

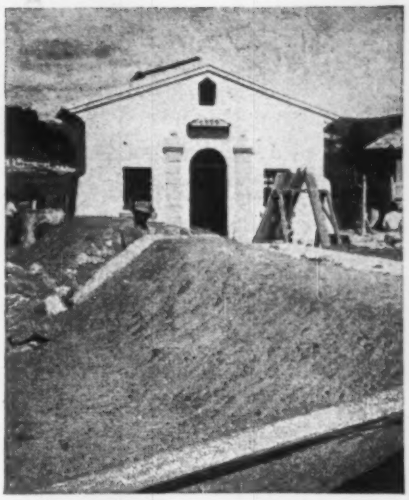
Tile Engineering—Publication of "Tile Engineering," a handbook for users of structural clay tile, including facing tile, is announced by the Structural Clay Products Institute, Washington, D.C.

The new volume, which contains 453 pages, is intended principally for architects, engineers and contractors. It contains detailed information and recommendations regarding mortar, the design and properties of structural tile walls, and the design and construction of walls, partitions, footings, foundations, piers and pilasters. Fire-resisting properties and methods of furring also are described in detail. An appendix contains estimating tables and specifications for various kinds of tile construction.

Monolithic Construction—R. G. LeTourneau, Inc., announces the publication of an eight-page brochure, RT-126, entitled "On-the-Site Monolithic Construction." This illustrated folder attractively portrays the new and modern way to build better homes faster, more economically, by the TOURNALAYER method. Such advantages as freedom of design, speed of erection, lower cost per square foot, superior construction, and world-wide distribution are presented to the reader in an interesting and convincing fashion. Prepared especially for large-scale contractors and operative builders, the booklet gives a complete description of how the TOURNALAYER operates and produces various combinations of basic, monolithic units in order to provide any size or style home. Numerous architectural renderings illustrate an unlimited freedom of architectural treatment. An additional folder, RT-125, has also been prepared which gives a general view of the LeTourneau method of home building. Readers may obtain copies of these new brochures by writing to the TOURNALAYER Sales Division, R. G. LeTourneau, Inc., Longview, Texas.

Ceramic Coatings—The National Bureau of Standards offers a publication—"Ceramic Coatings for High-Temperature Protection of Steel." A ceramic coating developed at the National Bureau of Standards for protection of low-carbon steel in high-temperature service has been used by the Army and Navy on exhaust systems of certain aircraft and other vehicles. Outstanding features are: (a) High resistance to chipping under repeated thermal shock, (b) protection against oxidation during prolonged exposure at temperatures up to about 1,250 deg F, (c) freedom from the cracking and blistering, and (d) a mat surface which decreases visibility. Copies may be obtained from the superintendent of Documents, Government Printing Office, Washington 25, D.C. Price, ten cents.

Truck Bodies and Hoists—Kewanee Mfg. Co. offers its newest Kewanee Bulletin, No. KBH 647, which illustrates and gives detailed specifications on their complete truck body and hoist line. Copies may be obtained by writing the manufacturer.



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Literature Available (Cont.)

Diesel Engine—A new 16-page, three-color booklet, Bulletin No. 1332, which describes and illustrates four heavy-duty Diesel engines ranging in size from 180 to 300 hp that are ideal for powering trucks, off highway and haulage equipment. This 16-page bulleting giving construction features, details regarding combustion, installation and design as well as many illustrations of actual installations of Buda engines being used in all types and kinds of haulage equipment is issued by the Buda Co., 154th and Commercial Ave., Harvey, Ill.

Lessons in Arc Welding—"Lessons in Arc Welding," third edition, published by The Lincoln Electric Co., Cleveland, Ohio, 158 pages, $5^1/_2 \times 8^1/_2$ in. 228 illustrations, including photos and drawings; cover, semiflexible simulated leather, gold embossed. Price, postage prepaid United States, 50 cents per copy; elsewhere 75 cents per copy.

Analyzing Municipal and Industrial Waters—A new 100-page technical bulletin No. 11 on the analysis of municipal and industrial waters has been announced by the Solvay Sales Corp. 40 Rector St., New York City. Designed to present methods suitable for rapid work without undue sacrifice in accuracy, the book contains sections on mineral analysis, stationary boiler water analysis, municipal and railroad water supplies, swimming pools, and pollution. It also gives information on reagents, indicators and standard solutions, conversion tables, a four-page index and a list of atomic weights.

Nickel and High Nickel Alloys Handbook—A compressed handbook and guide, "Nickel and High Nickel Alloys," is being distributed by the International Nickel Company. Written by Dr. Norman E. Woldman, consulting metallurgical engineer and former Chief Metallurgist for Bendix Aviation Corporation, it originally appeared in the technical press and has been made available in convenient reprint form. In addition to information on nickel, Monel, Iconel, and associated alloys it also includes material on such other alloys as the Hastelloys and Illium. Dr. Woldman reports on properties, heat and corrosion resistance, as well as on modern fabrication and finishing practices. It will be sent on request to The International Nickel Company, Inc., 67 Wall St., New York 5, N.Y.

Expansion Joints and Flexible Connectors—Zallea offers a new 60-page catalog on expansion joints and connectors exclusively. In pictures, text, and diagrams, it describes the various types of Zallea expansion joints, together with a description of the manufacturing processes for each joint. The catalog also includes 20 double pages of specific reference data on the many joints. Another section contains useful material on how to select the proper expansion joint for a given application and numerous application photos illustrate some typical uses. Copies of Catalog 47 may be obtained by sending a request on your company letterhead to: Zallea Brothers and Johnson, 814 Locust St., Wilmington 99, Del.

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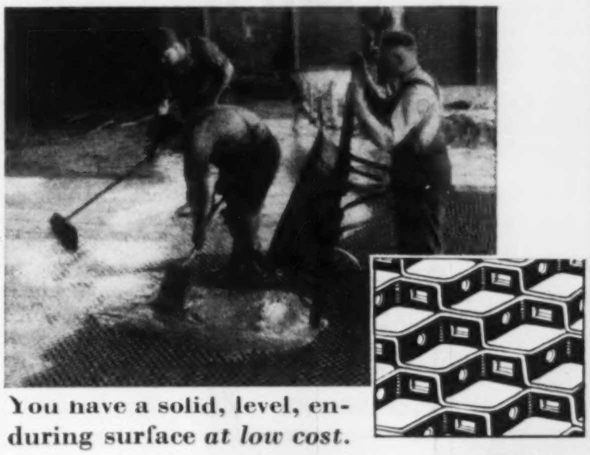

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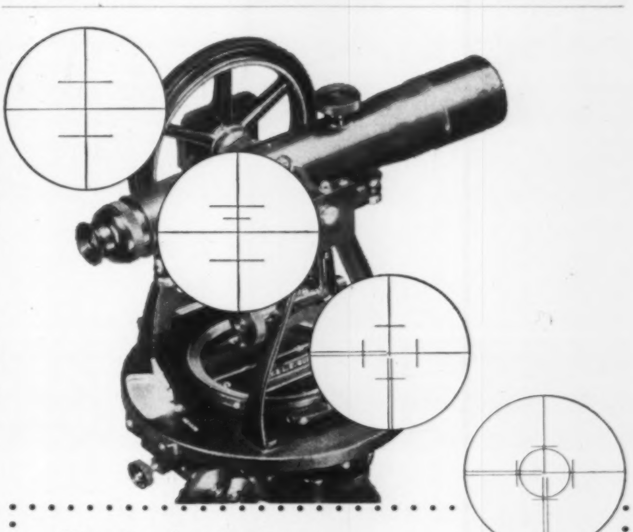

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Literature Available (Cont.)

Salem Tool Company Booklet—The Salem Tool Company's new booklet on the McCarthy Rock Boring Machine is just off the press. It is designed for the man who wants to drill holes–horizontal or vertical–in open or strip pits, for the contractor who wants to remove overburden on highway projects, and the contractor who wants to drill 6" to 16" holes under highways or streets for electric, gas, telephone, or water pipe lines. This 8-page booklet contains complete descriptions and illustrations of the McCarthy Earth and Rock Boring Machines in action, both horizontal and vertical types. The attractive red-and-blue folder also points out the many outstanding features and time-saving, labor-saving advantages of the Self-Propelled, Truck Mounted, and Trench-Type Units. Copies of the new Salem Tool folder will be mailed promptly upon request to the Salem Tool Company, Salem, Ohio.

Amsco-Nagle Pump—A new bulletin describing Amsco-Nagle, Ball-Bearing, Type "T" Industrial Pumps has just been published by the American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill. In picture magazine style, it features a minimum of copy and a maximum of photographs to "bare the facts" of the design and construction of these material handling pumps. Photographs, diagrams, and cross-sectional views explain the features of the Amsco manganese steel water-end parts that assure the maximum in resistance to impact, shock, and abrasion. Whatever the application—sludge or slurry handling, gritty water, or ash-handling—Bulletin 547-IP—sent on request—shows Amsco-Nagle units for these pump-punishing services.

Power Shovel Bulletin—"Power Shovel Dippers; Shovel and Dragline Parts" is the title of Bulletin 547-DS, just published by the American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill. Complete, detailed descriptions are given of all Amsco Dippers: the All-Manganese Steel Welded type, the Renewable Lip type, and the Missable type and other designs. Cross-section drawings and X-ray photographs highlight the outstanding design features. This new 40-page bulletin also demonstrates in detail how manganese steel parts help solve maintenance and breakdown problems. A section is devoted to a comprehensive discussion of austenitic manganese steel and its unusual properties. This guide to lower costs wherever power shovels and draglines are used will be mailed on request.

Small Turnapull Bulletin—A big broadside illustrating and describing LeTourneau's new small Tournapull has been prepared by the manufacturer. This large folder opens to 23" × 33", explains in detail and pictures the many new design features built into the new self-loading D Tournapull. Large-size, job action photographs show how the Tournapull can be used on small yardage projects for Contractors, Miners, Loggers, Pit and Quarry Operators, Railroads, Industries, Counties. The inside spread gives complete specifications on the one-man-operated rig.

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